

# FLIGHT

*The*  
**AIRCRAFT  
ENGINEER  
&  
AIRSHIPS**

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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## Flight

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## DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:—

1926	
Feb. 4	Joint Meeting of R.Ae.S. and Inst.A.E. at R. Soc. of Arts. Mr. C. L. Lawrance, "American Aircraft Engine Development."
Feb. 9	Informal Meeting, Inst.Ae.E.
Feb. 25	Mr. A. J. Cobham. "Long-Distance Aeroplane Flights," before R.Ae.S.
Mar. 4	Maj. G. H. Scott. "Development of Airship Mooring," before R.Ae.S.
Mar. 9	Mr. O. E. Simmonds, M.A., A.F.R.Ae.S., M.I.Ae.S. "The Development of Civil Marine Aircraft," before Inst.Ae.E.
Mar. 18	Flight-Lieut. H. Cooch. "Landing Aeroplanes in Fog," before R.Ae.S.
April 13	Mr. S. H. Evans, B.Sc. "The Performance of Modern Aircraft—with special reference to the Variable Wing," before Inst.Ae.E.
April 15	Capt. G. T. R. Hill. "The Tailless Aeroplane," before R.Ae.S.
April 21	Inst.Ae.E. visit to Messrs. D. Napier and Son, Acton.

## EDITORIAL COMMENT.



COMMENCING with this week's issue of FLIGHT, we publish the first of what will, we hope, be a long series of monthly supplements dealing with the more technical aspects of aviation, and emphasising THE AIRCRAFT ENGINEER, our sub-title, which, as our readers know, has formed part of the title of FLIGHT for a number of years. As all interested in the subject are aware, there is in existence a wealth of data on aerodynamic problems and phenomena, and a perhaps somewhat smaller amount of literature on structural design. In addition, we have two excellent societies in the Royal Aeronautical Society and the Institution of Aeronautical Engineers, at both of which are read, at fairly frequent and regular intervals, papers dealing with various aspects of the art and science of flying.

At first glance it might appear that there was little scope for elaborating subjects relating to the technical side of aeronautics. Yet we have felt, and we believe the great majority of our readers will agree with us, that a useful purpose can be served by the issue of technical supplements to FLIGHT such as that which we present to our readers this week.

Concerning the vast amount of data available on aerodynamic subjects, it can be said that, generally speaking, far more data exist than can be made practical use of in the everyday work of designing aircraft, and that it is in the application of such data, in the sorting out and evaluation of the enormous amount of information in existence, that the difficulty lies. How much of such information is reliable, how much is immediately applicable to full-size aircraft, what correction factors must be applied, and so forth. In the main it rests with the practical aircraft designer to use his own judgment in these matters, and consequently it is, in the end, the practical man who has to make use of the data provided by the scientist. By obtaining the co-operation of a number of well-known British aircraft designers we hope to publish, in THE AIRCRAFT ENGINEER section of FLIGHT, articles dealing with the personal and practical experience of

each, the value of which to other designers cannot very well be estimated, but which cannot fail to be of interest and assistance.

Concerning existing societies and institutions, it is not felt that by collating technical subjects once a month in a supplement we shall be in the slightest degree interfering with their usefulness, nor overlap to any considerable extent the excellent work done by them. Rather do we think this section will be found to supplement them, and that, by appealing to a wider circle, will assist in creating a keener interest in the technical side of aviation, with consequent increase in membership of the societies. The number of people who are in a position to attend lectures is necessarily limited, whereas a technical supplement to FLIGHT reaches thousands of people at home and abroad who are interested in the subject but who, for personal or geographical reasons, cannot attend the meetings of a technical society or institution. Then there is another aspect of the question. There are, to our personal knowledge, a large number of technical men who find difficulty in speaking in public, and whose voice is, consequently, seldom or ever heard in discussions. In the case of our engineering section such will be able to take part, by letters for the Correspondence columns of FLIGHT, in a discussion of the articles contributed to the monthly supplement, and the result of their knowledge and experience will thus become available in cases where they would be likely to remain dumb in a verbal discussion. It is intended to throw the Correspondence columns of FLIGHT open every week to discussion of articles that have appeared in the engineering supplement, as by doing this we can conserve more space in the necessarily limited number of pages which we can afford to give to the monthly technical section.

Concerning the first issue of this section we need say little. The supplement will speak for itself, and must be judged entirely on its merits. We have been extremely fortunate in securing the whole-hearted co-operation, in the form of signed articles, by such well-known men in the aircraft industry as Mr. Handley Page, Maj. Green, Mr. Sigrist and Mr. Short; and in subsequent issues of THE AIRCRAFT ENGINEER we hope to publish articles by other equally well-known designers and constructors, a number of whom have promised their co-operation. To those who have helped us to produce this first issue we extend our cordial thanks, and we believe that each has, in his own way, contributed something to the general knowledge, which will be appreciated by all the more technically minded of our readers. Our non-technical readers, if they are not able to follow the various arguments, may, at any rate, obtain a general idea of the conclusions, and at the worst they have always the alternative of skipping this section altogether.

#### The Auxiliary Air Force

The discussion at the monthly dinner of the Royal Aero Club on Jan 20 on the Auxiliary Air Force certainly cleared the air, and elicited some facts which,



#### R.A.F. Badges

SUPPLIES of the badge which it was decided last September to supply to officers attached to the Royal Air Force for service in the Fleet Air Arm (illustrated in FLIGHT for November 12 last) are now ready for issue at the Royal Clarence Yard, Gosport. Two kinds of badges are stocked, one without safety pins, price 2s. 9d., and another with safety pins, for use with white uniform, price 3s. 6d. In

although previously published, had not been generally realised. Taking the debate as a whole, the fact emerges that the future of this force, and presumably the future of the Special Reserve squadrons likewise, is not strictly speaking an aeronautical matter at all. It depends on policy, and on the manner in which that policy is carried out. Guidance should be sought from the lessons of the old volunteering movement and from the Territorial Army which has succeeded the old volunteers. The policy to be adopted depends on knowledge of men far more than on knowledge of machines; and sound counsel should be sought rather from experienced officers of the citizen armies than from aeronautical experts.

Mr. Handley Page touched on one matter which was very much to the point, namely whether employers should encourage their mechanics to join the A.A.F. On the outbreak of war those mechanics admittedly would be needed at their factories even more urgently than at their squadron aerodromes. Nevertheless, we hold that aircraft mechanics should be encouraged to join up, as they will help to set a standard and will act as a leaven among the other airmen who have all to learn. Squadron leaders, in our opinion, should accept those men for that reason, but should realise that they will lose them immediately an emergency occurs.

Major Mayo raised the question of pay. As a matter of fact all members of the A.A.F., like the Territorials and old Volunteers, do receive pay on appropriate occasions. The chief point about pay for a citizen soldier is, not that it attracts a more desirable type of man (it does not have that effect), but that it gives him a certain status.

The theory was put forward that in a technical corps a prime necessity is that the officers must be more highly technical than the other ranks. Though technical knowledge is desirable, by far the most necessary quality in an officer is ability to command, to understand his men, to lead, to organise. An officer who has that capacity in full measure will always find technical knowledge willingly supplied by loyal and enthusiastic assistants. On the other hand the greatest technician in the country may be incapable of commanding anything.

A point of prime importance which was not brought forward on Wednesday evening is the sentiment which is to exist between the regular R.A.F. and the two citizen air forces. If a genuine feeling of brotherhood in arms and of the air is generated now while all the forces are young, the future path of the new forces will be smoothed to an extent which can hardly be realised by those who have had no experience of the difficulties of the old Volunteers. Wars which really are wars cannot be won by Tommy Atkins or his aerial counterpart; it is necessary to call in John Bull. It therefore behoves the Royal Air Force to give the help and encouragement which no one else can give to the new citizen squadrons; and it is particularly the duty of the Air Staff to omit no step which can in any way foster good feeling between the two classes of force.

future the badge will be assumed by attached officers immediately on joining a training school of the R.A.F. for their initial flying training.

The Air Ministry has granted to the County of London (Bombing) Squadron a permit to have a distinctive badge, to be used side by side with the national device on the fuselage. This badge has been designed by the College of Heralds and consists of the sword of London piercing a pair of wings, in crimson, on a white ground.

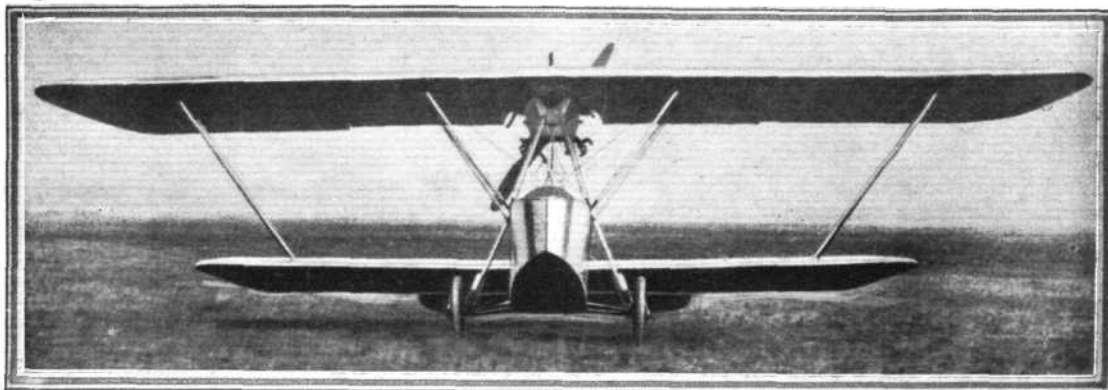
# "A FLYING BOAT ON WHEELS"

[The Albatros L.72 Two-Seater Light 'Plane

It is a characteristic of modern tendency in aircraft design that, except for flying boats, the "pusher" type of machine is now practically never seen. Much of the early experimental work was done on pusher machines, commencing with the early machines built by the Wright brothers, and continuing for a considerable time after the outbreak of the war, 1914-18. When Mr. A. V. Roe introduced the tractor type of biplane, the type met with such instant success that it very quickly became adopted, not only in this country, but throughout the world, until at the present moment it is almost the only type ever seen as far as single-engined machines are concerned, with the one exception mentioned above, *i.e.*, the flying boat.

with the engine in the trailing edge of the top plane. It was considered that the pusher with open girder tail booms was ruled out for aerodynamic reasons, the tail girder offering too great air resistance. The tail-first machine and the tailless machines, although offering interesting possibilities, were of somewhat doubtful qualities, as many problems have not yet been solved in connection with them, such as dynamic stability, controllability and behaviour in spins, and so the Albatros designers, by a process of elimination, arrived at the fuselage type with the engine built into the top plane. The result was the "flying boat on wheels" shown in the accompanying illustrations.

The Albatros L.72: This front view shows that in spite of the interplane struts, the wings are of the cantilever type, without external bracing.



We think the majority of those of our readers who had any experience of the pre-war pusher aeroplanes will probably agree that for sheer comfort in flying the old pusher had much to recommend it. For one thing one was not worried by a slip-stream of high velocity as soon as one looked over the cockpit coaming, and the engine noise was greatly lessened owing to the placing of the power plant behind the occupants. That the pre-war type of pusher aeroplane, with open tail booms incorporating a fair amount of wiring, was a super-efficient type can scarcely be argued, but if one is not concerned with ultra-efficiency, there is much to be said for the type, and it is therefore rather interesting to find a German designer reverting to the pusher type in a machine designed for the recent German "Sales Competition." The rules for

The Albatros L.72 is a two-seater light 'plane, with a fuselage of mixed construction, and with the wing area arranged in the form of a biplane, the lower plane of which is considerably smaller than the top plane in both span and chord. The biplane type was chosen in order to get the greatest practicable wing area into the smallest overall size, and also to keep down the item of wing weight. The competition placed a premium on rate of climb rather than on top speed, and rate of climb was more easily obtained with light wing loading. It was also desired to give the two occupants as good a view as possible, and in order to attain this object the two main planes were very heavily staggered in relation to one another. A glance at the illustrations will show that the stagger is so pronounced indeed that the problem of building a biplane with the usual



Albatros L.72  
Light 'Plane:  
Side view. Note  
the pronounced  
stagger.

this competition were designed with the object of producing safe and comfortable machines, rather than machines of very high efficiency and having a high top speed. Among the stipulations for this competition, mention may be made of the fact that the take-off must not occupy more than 100 m. and the machine must pull up after touching in not more than 75 m., while the rate of climb must be greater than 1.5 m. per second (300 ft./sec.). The top speed must exceed 90 kms./h. (56 m.p.h.). It was also stipulated that the machines must be of the pusher type.

According to our German contemporary, *Illustrierte Flug-Woche*, the Albatros designers considered the following possible arrangements to comply with the regulations: the tail-first or canard type of machine, the tailless aeroplane, the pusher with open girder tail booms, and the fuselage machine

external wire bracing would probably have been extremely difficult, owing to the very poor angle of the inter-plane struts. It was therefore decided to make the machine a cantilever biplane, and the inter-plane struts are intended mainly to stiffen the wings against torsional stresses.

Except for the unusual stagger, the Albatros L.72 is designed very much as is a flying boat, that is to say, the engine structure is independent of the wing structure to the extent that, although faired into the top wing surface, the engine is carried on four separate tubes, rising from the fuselage. The top plane is supported from the fuselage by two N-struts braced diagonally to centre them over the fuselage, but outside these N-struts there is no wire bracing of the wings.

Both top and bottom planes have wing spars and ribs of spruce, and the spars of both planes run right through. The

top plane is perfectly straight, but the bottom plane has a dihedral of  $1\frac{1}{2}$  degrees. Fittings are mainly of duralumin and the inter-plane struts are steel tubes with sheet aluminium fairings. The wing section is a fairly thick one (about 9 in. on the top plane) and was chosen on account of its high

value of the ratio  $\frac{K_L^3}{K_D^2}$ , which governs the climb.

In the construction of the fuselage two distinct methods have been employed. The front portion, in which the cockpits for pilot and passenger are accommodated, is a flat-sided, plywood-covered box, built rather stronger than strictly necessary in order to provide protection for the occupants in case of a

would not suffice would be during a steep dive. The petrol tank has a capacity of 50 litres (11 gals.) and the oil tank, which is placed immediately ahead of the engine, has a capacity of 12 litres (2.64 gals.).

The undercarriage is of simple type, the two wheels being carried on short stub axles hinged to the lower longerons of the fuselage and braced forward by tie-rods forming horizontal V's with the axles. Springing is provided by telescopic struts running to the top longerons of the fuselage, and rubber shock-absorbing gear.

The tail planes are of duralumin and steel construction and fabric covered, and provision is made for trimming the tail plane, this obviously being advisable in a machine of this



The Albatros L.72: The 55 h.p. Siemens radial engine is mounted on the trailing edge of the top plane, and drives a pusher air-screw. The view from the cockpits should be excellent.

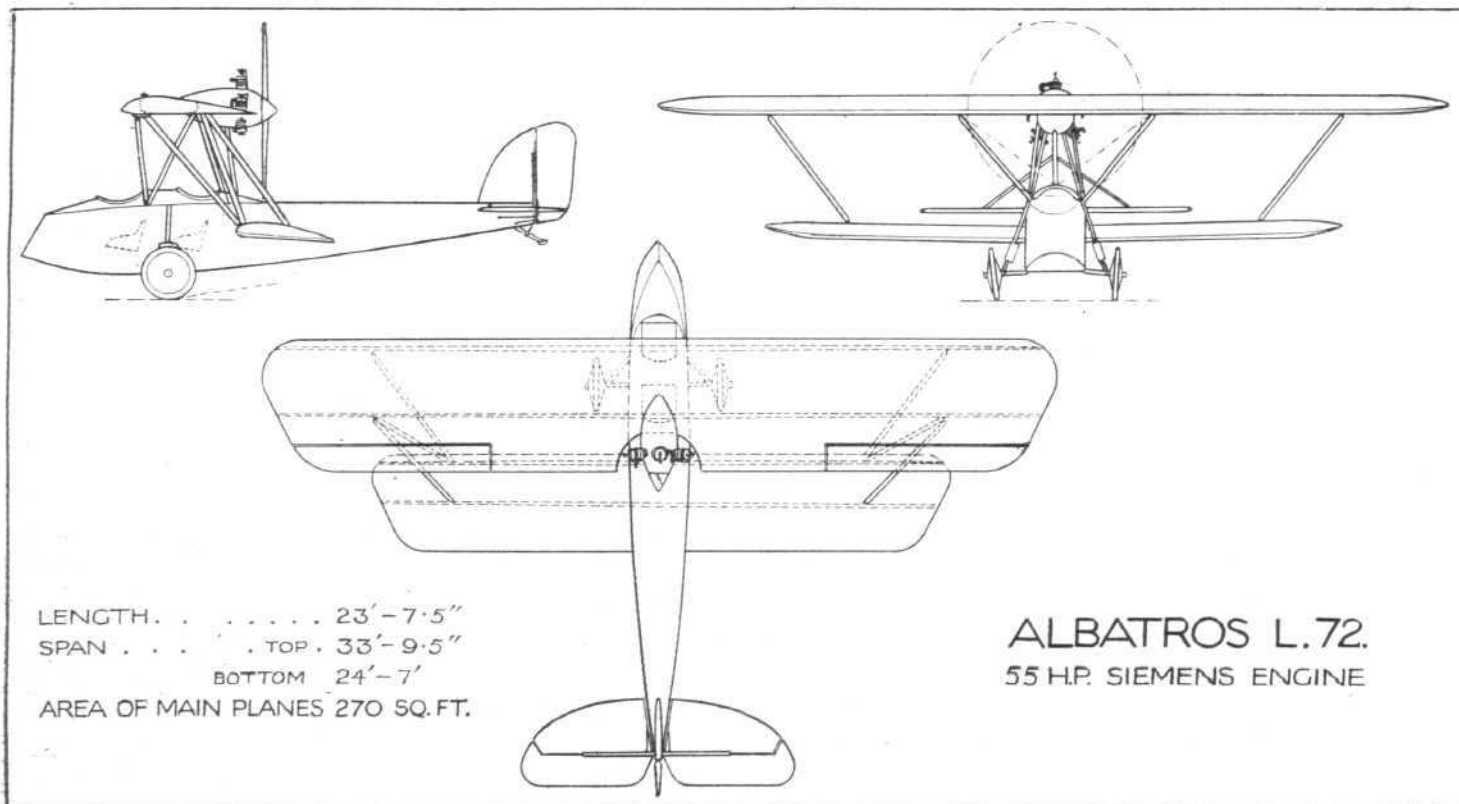
crash. The rear portion of the fuselage is in the form of welded steel tubes with piano-wire bracing, and the two halves of the fuselage are joined just aft of the passengers' cockpit. Incidentally it may be mentioned that the lower plane passes through the welded tube portion where the question of its insertion and attachment is rather easier, owing to the fabric covering.

As already mentioned, the 55 h.p. Siemens radial engine is mounted on four steel tube struts from the top of the fuselage, on a structure independent of the wing structure. A neat aluminium cowl fair the engine into the top wing surface and a spinner round the propeller boss at the back completes the fairing of the power unit, of which only the outer portions of the cylinders project. The petrol tank is built into the top plane forward of the engine, and although it is stated that gravity feed is employed, provision is made for maintaining a slight pressure in the petrol tank. As the tank is ahead of the engine, presumably the only time when gravity feed

type, where considerable changes in trim may be expected between the "engine on" and "engine off" condition. It is stated, however, that the machine handles very nicely, and that the only change with engine fully throttled down is a slight tail-heaviness which is easily corrected by slightly increasing the angle of incidence of the trimming tail plane.

The main overall dimensions of the Albatros L.72 are shown on the general arrangement drawings. Following are the main item weights: weight of machine empty, 450 kg. (990 lb.); pilot and passenger, 160 kg. (352 lb.); petrol, 38 kg. (83.6 lb.); oil, 12 kg. (26.4 lb.); total loaded weight, 660 kg. (1,452 lb.).

The wing loading is 5.38 lb./sq. ft. and the power loading 26.4 lb./h.p. With the useful load indicated above, the original machine attained a top speed of 125 k.m./h. (78 m.p.h.) at ground level, and the landing speed was 65 k.m./h. (40 m.p.h.). An altitude of 1,000 metres (3,300 ft.) was reached in 12 minutes.



A MODERN "PUSHER" LIGHT 'PLANE: General arrangement drawings of the Albatros L.72 with 55 h.p. Siemens radial air-cooled engine.

# The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

## COMMITTEE MEETING

A MEETING of the Committee was held on Wednesday, January 20, 1926, when there were present:—Lieut.-Colonel F. K. McClean, A.F.C., in the Chair, Ernest C. Bucknall, Lieut.-Colonel M. O. Darby, Lord Edward A. Grosvenor, Wing-Commander T. O'B. Hubbard, M.C., A.F.C., Lieut.-Colonel M. O'Gorman, C.B., F. Handley Page, C.B.E., T. O. M. Sopwith, C.B.E., and the Secretary.

**Election of Members.**—The following new Members were elected

James Arnold Brewster,  
Stephen Donoghue,  
John Philip Hall,  
Alonzo Limb,  
William Newton,  
Walter Ridley,  
Thomas Neville Stack.  
Ernest Leslie Howard Williams.

**Aviators' Certificates.**—The following Aviators' Certificates were granted:—

7978. Charles d'Urban Shearing, February 15, 1925.

7979. Robert Nixon Thompson January 7, 1926.

7980. Kenneth Macdonald Beaumont, January 8, 1926.

**Committees.**—Reports from the following Committees were received and adopted: Joint Standing Committee of R.Ae.C. and S.B.A.C., House Committee, Finance Committee.

**Britannia Trophy.**—It was decided to consider the award at the next meeting of the Committee to be held in February. In the meantime the Secretary was instructed to prepare a list of meritorious performances for the year 1925.

**Annual General Meeting.**—The Annual General Meeting of the Club was fixed for Wednesday, March 31, 1926.

**F.A.I. Paris Conference.**—Colonel M. O'Gorman reported

on the Paris Conference of the F.A.I. held on January 11, 1926. The report included the following items:—

*The Rules of the Schneider International Seaplane Race, 1926.*

*The Rules of the Gordon Bennett Balloon Race, 1926.*

*Aviators' Certificates. Test "A."*

The compulsory flight of one hour at an altitude of 6,000 ft. was eliminated. Test "A" would now be as follows:—

"A flight without landing during which the pilot shall attain a height of 2,000 metres above the point of departure. The descent shall finish with a glide the engine cut off at 1,500 metres above the landing ground. The landing shall be made within 150 metres or less of a point fixed beforehand by the Official Examiners of the test, without starting the engine again."

A vote of thanks to the Club delegates (Lieut.-Col. M. O'Gorman and Major J. S. Buchanan) was unanimously passed.

**Foreign Attachés.**—The following Attachés were elected Honorary Members of the Club for the year 1926:—Lieut. J. Bos (France), Commander R. A. Burg (America), Major H. C. Davidson (America), Capt. Luke N. McNamee (America), Commander J. C. Hunsaker (America), General A. Guidoni (Italy), Henri F. Martin (Switzerland), Capt. T. Toyoda (Japan), Lieut.-Commander Hirose (Japan).

**Private Flying.**—The following Sub-Committee was appointed to draw up recommendations on Private Flying:—F. Handley Page, C.B.E., Lieut.-Col. M. O. Darby, Major H. Hemming, Squad.-Leader M. E. A. Wright, H. E. Perrin (Secretary).

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3, CLIFFORD STREET, LONDON, W. 1.

H. E. PERRIN, Secretary

## Britannia Trophy.

THE Committee of the Royal Aero Club will consider the award of the Britannia Trophy for the year 1925 at its meeting in February next. The Britannia Trophy is awarded each year "to the British Aviator, who, in the opinion of the Committee of the Royal Aero Club, shall have accomplished

the most meritorious performance in the air during the year." The Royal Aero Club will be glad to receive particulars of any meritorious performances for consideration by the Committee when making the award. Particulars should be addressed to the Secretary, Royal Aero Club, 3, Clifford Street, London, W.1, not later than February 15, 1926.

## ROYAL AERO CLUB THIRD MONTHLY HOUSE DINNER

### The Auxiliary Air Force Discussed

THE subject for discussion at the third monthly dinner of the Royal Aero Club was the Auxiliary Air Force, and the chair was taken by Squadron-Leader Lord Edward Grosvenor, commanding No. 601 County of London (Bombing) Squadron. The loyal toast was proposed by the Chairman and duly honoured before the appearance of the pudding, and consequently, when the Chairman rose a second time to open the discussion, he felt bound to remark that the situation was obscure, owing to the fumes of tobacco smoke, but he declared that the Auxiliary Air Force would find its way through the gloom. He declared also, amidst applause, that it would carry on the old tradition of the Royal Air Force. He then called on Air-Commodore J. G. Hearson, C.B., C.B.E., D.S.O., who is the responsible officer for Special Reserve and Auxiliary squadrons, to address the company.

Air-Commodore Hearson said that there had been a good many public pronouncements on the subject, but there was a certain amount that was worth reiterating. The Auxiliary Air Force was on the same lines as the Territorial Army and the terms of service were very similar. The A.A.F. squadrons were intended to take their place among the combatant units of the Air Defence Force. They would be in the front line of air defence. They were all intended to be bombing squadrons, and bombing was the counter-attack of the defence. There was nothing of the Reserve about the A.A.F. Every officer and every airman undertook to be at his post at the first threat of air invasion, and to set out on bombing expeditions described as "the points of departure and of intended return" (laughter) of which were in this country. It was a real man's task. There would be no time for training or enlistment on a wave of patriotic ardour. Every officer and

airman must be at his post before the whistle blew. The man who waited for the war to break out would be too late.

There were a good many reasons why certain squadrons should be on an auxiliary basis. One important reason was the desire that flying should be spread among the civil population and that men should get in touch with service flying while remaining civilians. The Royal Aero Club was doing great work in promoting the civilian flying clubs which would be splendid recruiting grounds for the A.A.F., and he would like to see one such club in the same district as every A.A.F. squadron. As for the progress up to date, already four squadrons had made a beginning, two in London, one in Edinburgh, and one in Glasgow. A fifth was in prospect during 1926 at Birmingham. Three of the commanding officers were present at the table. No. 600, the City of London Squadron, had had a large number of applications for commissions, and there would be no difficulty in finding good officers. As for No. 601, the County of London Squadron, their chairman of that evening was always coming to him to tell him of his latest find, and he walked about the street with a formidable list of names in his pocket. As for the two Scottish squadrons, applicants for commissions were not exactly tumbling over each other. The speaker sought for an explanation in the Scottish character (with which he is evidently not very well acquainted, but when tackled by a subsequent speaker about his remarks he gave an assurance that he had not intended anything disrespectful about it.) As regards airmen, on the other hand, recruits were coming forward for the two Scottish squadrons in good numbers and good quality. On the first parade at Edinburgh the regular airmen were quite anxious about their own prowess beside

the recruits. The latter were many of them skilled tradesmen, of the type which they wanted, and many had been Boy Scouts or had come from the Boys' Brigade. In London recruiting was slow. It was harder to spread the gospel there and to awaken the family feeling, although they had in the chair a wonderful example of the Squire. (Applause.) But they did not want to rush things, and they wanted to have as few mistakes to regret as possible. They did not want the wrong type of recruits. For instance, quite recently 1,500 recruits came forward for the Special Reserve Squadron in Belfast, and of them only 10 could be accepted. That showed that they were keeping the standard high, and that a good man would be sure of finding himself in good company. He ended with a word of praise for "that super-man" the regular adjutant of an A.A.F. squadron.

Mr. Handley Page made an eloquent, amusing, and serious speech, in which he took two points and rubbed them in very hard. One was that if the employees of aircraft factories joined the A.A.F., on the outbreak of war they would have to leave the squadrons as they would be more urgently required at their factories. The second point was that man-power would be little use in the next war without adequate equipment, and that if the aircraft manufacturers could not maintain and preserve in peace-time a strong staff of skilled hands, they would not be able to get them after the outbreak of war, and, in consequence the A.A.F. and other air forces would not get that equipment.

He began by saying that he hoped he would not disappoint the company by being serious but on the subject of defence they would have to be serious. The A.A.F. deserved the sympathy of every employer. But if their employees all joined up, where could they recruit more in war-time? In the next war the army would be mechanised, and there would be a great demand for mechanics. This was an opportune time to discuss the A.A.F. They had a R.A.F., an A.A.F., and the industry. In 1915 we had man-power, but we failed for want of munitions. Our soldiers had no shells and no aircraft to make victory possible. Then in 1917 the United States of America came into the war, and decided that aircraft could find the way to victory. What did they do? They spent £650,000,000 sterling, "a sum on which I should be quite willing to retire" (laughter). They turned out about two aeroplanes which were able to fly across the lines. He would not be satisfied with that result, even from Cricklewood. The lesson was that we must think out our plans for providing equipment in good time. Older civilisations had passed away because their equipment had not been equal to their degree of civilisation. The Romans worked on man-power. The barbarians beat them at that game. He thought of the hordes of Russia, which had no rifles, no equipment, because they had no factories.

We were now faced by a crisis. There was need for stringent economies, and we must cut down our expenditure. There were two sorts of economy, one apparent but false, the other long-sighted and real. We were no longer an island, but we were spending millions on our navy and army which were completely obsolete (sensation). It was a fact; they were no use at all when they could be bombed by aircraft. The authorities would probably say: "The aircraft industry has made profits in the past: they can keep them and carry on." The aircraft industry was not like the motor industry, and technical improvements such as super-charged engines (a voice: "and slotted wings") might change the whole of our equipment and change it for the better. So our engineering staffs must be looked after. In 1946 it would be no use to go to war with Henry Farman box kites. If it were proposed to cut down Hanwell ("I mean Halton and Cranwell") there would be an outcry, for they represented man-power, but when it came to cutting down the industry—!

Mr. G. C. Colebrook asked for more information about the A.A.F. What attractions did it hold out to the mechanic who was asked to do in his spare time what he had been doing all the week? Would the A.A.F. squadrons be ready to bomb on the outbreak of war? He thought that the Navy was still necessary for securing the trade routes and our supplies, though when the ships approached harbour the aircraft co-operated with the warships.

Air-Commodore Hearson replied to these two speeches. He thought the industry might spare them some mechanics, for magnificent equipment would be of no use if only the fools of

the nation were put in charge of it. The spread of interest among the civil population would indirectly help the employers. As for Mr. Colebrook's questions, they could not foretell the result of the experiment, but it was worth making it. In Scotland they were actually getting mechanics who would take a "busman's holiday," and he did not think that London would for long lag behind.

Commander Perrin, after eliciting the fact that a successful candidate for a commission could be recouped on his expenses in learning to fly, up to £115, said that the aeroplane clubs were teaching men to fly for about £15-£20, and he thought that the Government should give the clubs a bonus for each man so taught.

Wing-Commander A. W. H. James, commanding No. 600, City of London Bombing Squadron, said that the two popular watchwords of the day, Economy and Democracy, would be met in the A.A.F. He explained that among the attractions which would tempt a mechanic to take a "busman's holiday" was a good club at headquarters, where he could get his lunch in comfort.

Mr. T. O. M. Sopwith restored geniality to the discussion (this garment had begun to wear somewhat thin) by remarking that the Aero Club did not wish to ask all these high Service officers to attend merely in order to pull them to pieces. If the industry were on a proper footing, it could give more help to the A.A.F., to which, however, he wished all good luck.

Major Mayo said that the conditions of the A.A.F. were such that few could afford to join. They must look for leisured men, *e.g.*, fox-hunters (Wing-Commander James had remarked, amid laughter, that his proper vocation was to hunt the fox). Voluntary assistance was not a right principle, and the Government should pay those who joined. If that were done, we might reduce the regular R.A.F. to a nucleus and have a large A.A.F.

Squadron-Leader H. Dawes, M.B.E., of the S.R. & A.A.F. Headquarters, stated that the good supply of airmen for the Scottish squadrons had nothing to do with industrial depression in that country, as had been stated. On the contrary, they would not accept a man who was unemployed. They wanted men with an address, about whom they could find all particulars. He informed some speakers, who had shown ignorance of the fact, that 25 per cent. of the airmen in an A.A.F. squadron were regulars from the R.A.F., while all ranks were paid according to their ranks when attending annual training, and when specially called up for duty, &c., and bounties were also given.

Mr. G. Dorman said that he was always receiving requests for information from men who wanted to join, but only about one a month found that they could afford to do so. If the Air Ministry would pay for learning to fly, they would get a lot more candidates.

Capt. W. H. Sayers said that he had flown 500 hours as a pilot without a ticket, and he could not afford to take one out now. He expressed the opinion, quoting the example of a Territorial Electrical unit, that officers of a technical unit ought to be more highly technical than the men under their command.

Commander F. L. M. Boothby asked why we should concentrate attention on the air defence of London? We should provide for the safety of the trade routes and of the Empire, and in doing so the help of the Navy was essential. To this and to other criticisms, Air-Commodore Hearson replied that he was not responsible for politics or strategy.

Squadron-Leader Lord Edward Grosvenor remarked that his airmen were coming along all right, and that No. 601 Squadron would yet surprise them all.

Colonel Mervyn O'Gorman, in a brief, witty, and excellently expressed speech, said that he wanted to help to dilute the more bilious part of the discussion. He thought that the points of view of Air-Commodore Hearson and Mr. Handley Page could be reconciled. The trouble was that we had entrusted initiative to Democracy, which was only competent to exercise a veto. What should be done was to back Air-Com. Hearson in order that Mr. Handley Page might win.

Colonel Frank McClean then proposed a vote of thanks to Air-Commodore Hearson and the other official speakers, Lord Edward Grosvenor and the Air Commodore returned thanks, and a quite lively evening ended in an atmosphere of general geniality.

#### The Royal Air Force Memorial Fund

THE usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House on January 21. Lieut. Commander H. E. Perrin was in the chair, and the other

members of the Committee present were: Mrs. L. M. K. Pratt-Barlow, O.B.E., Squadron-Leader E. B. Beauman. The Committee considered in all 13 cases, and made grants to the amount of £368. (Next meeting:—February 4.)

## LIGHT 'PLANE CLUB DOINGS

### London Aeroplane Club

FLYING was only possible on three days during the past week and the total flying time was 12 hours 10 minutes. Owing to the recent accident to G—EBLU, only one machine was available, and the pilot instructor, G. T. Witcombe, was given very little rest. On Sunday there was a large booking, and Mr. Witcombe on that day alone made 15 flights with Members.

The following Members had flying instruction:—G. Quirk, V. H. Doree, C. G. Murrell, O. R. Ogston, E. S. Brough, R. V. Banks, H. O. Richardson, T. W. Eady, D. Kittell, B. B. Tucker, W. Hay, K. V. Wright, H. R. Thomas, P. Johnson, R. P. Cooper, Miss O'Brien, R. C. Brighton, G. Wallcousins, R. L. Preston, N. Jones, G. W. Howe, H. R. Presland.

The following Members flew solo:—Mrs. Elliott-Lynn, P. G. Lucas, G. N. Warwick, G. H. Craig.

The dance at the Suffolk Galleries on January 13 resulted in a sum of nearly £40 being raised for the fitting out of a members' shed at the aerodrome.

### The Lancashire Aero Club

FLYING took place on Wednesday and Sunday. Mr. Cantrill and Mr. Scholes gave "dual" instruction to:—H. Jowett, 35 mins.; P. Michelson, 30 mins.; A. Goodyear, 25 mins.; H. Stern, 40 mins.; R. Williams, 1 hour; J. Leeming, 1 hour 40 mins.; A. Macnair, 30 mins.; F. Davison, 35 mins.; M. Lacayo, 30 mins.; T. Wilkinson, 20 mins. Tests occupied 30 mins. 10 pupils had instruction. Total time flown, 7 hours 15 mins.

A Special Sub-Committee is to be appointed to deal with the question of the garments worn by Mr. Goodfellow, who on Sunday far outclassed ever Mr. Stern at his best. It is believed that the Hall Porter from The Imperial Hotel, Hythe, is to be approached with a view to him making his well-known remark, "You can't do that 'ere air." Mr. Rex Williams, to whom this remark was addressed with such frequency at the last Lympne Meeting, is strongly in favour of trying this remedy.

### The Newcastle-upon-Tyne Aero Club

FLYING report for week ending January 24, 1926.—The weather has been against flying again this week, and the Club is still hampered when the weather is good in having only one machine in service. No flying was

possible at all on Thursday and Saturday, but a total of 12 hours 38 mins. was accomplished, all on LX.

**Dual Instruction with Major Packman.**—Miss C. R. Leathart has the largest total for the week, with four flights totalling 2 hours 10 mins. Mr. A. E. George (30 mins.), Mr. A. J. Somerville (35 mins.), A. Bell (15 mins.).

**Secondary Dual.**—Mr. Irving (1 hour 30 mins.). Mr. R. N. Thompson (1 hour).

**Solo.**—Mr. Stobie (30 mins.). Mr. Heppell, four flights totalling 1 hour 18 mins., with the following as passengers:—Mrs. Lucas, Mr. Herdman, Mr. Stanley and Mr. Ogden. Mr. R. N. Thompson (15 mins.), Mr. W. Baxter Ellis, 59 mins. solo, and 20 mins. with Major Packman as pilot, while he took cinematograph pictures. Mr. N. S. Todd, one solo of 15 mins. and three flights with passengers—Mr. W. Todd, Mr. W. Robson and Mr. J. Gibson—a further 32 mins. Mr. Walton carried out his height tests on Tuesday, remaining up for 2 hours.

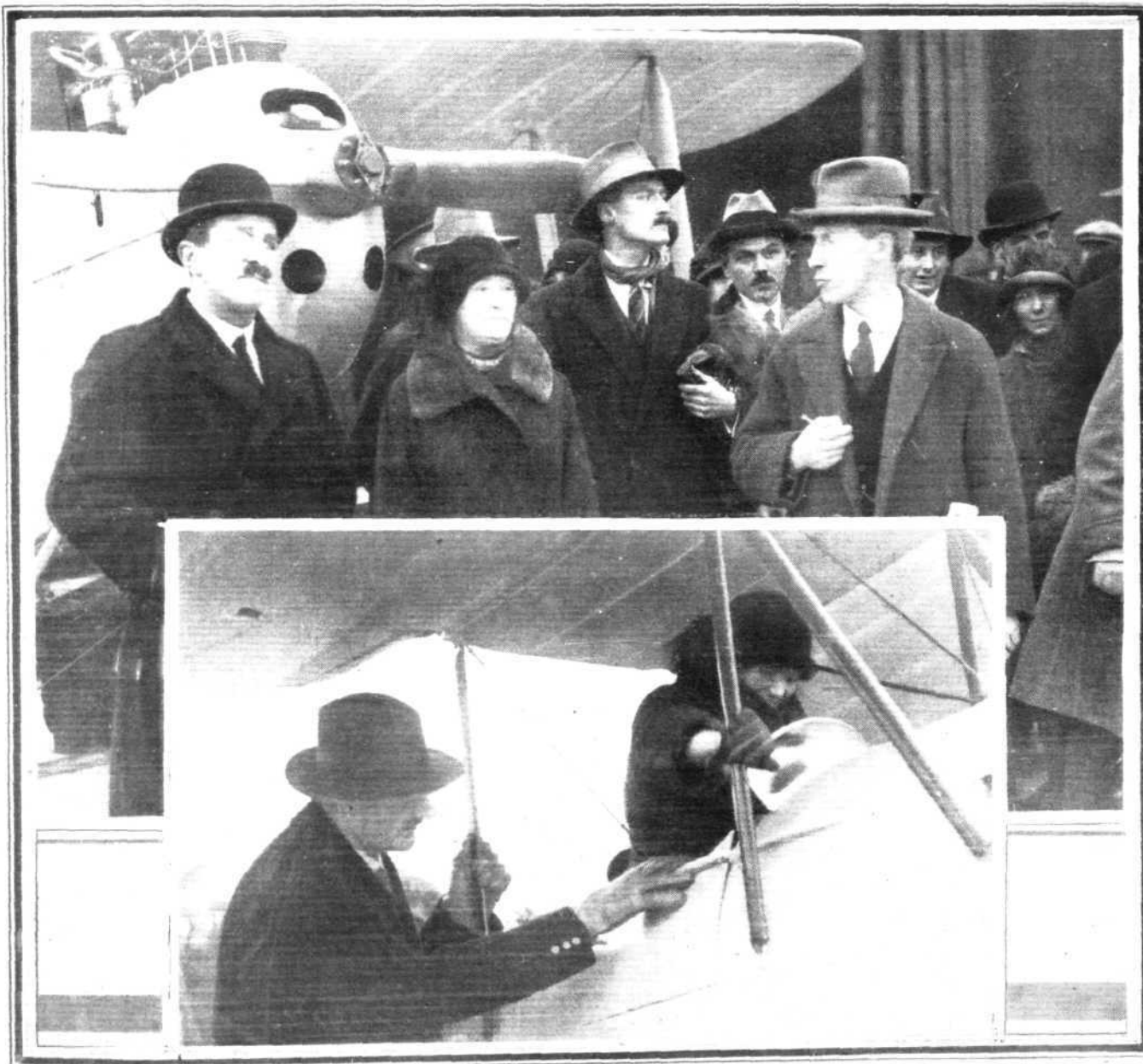
Major Packman took Miss Drummond for a 15 mins. flight on Wednesday. Instructor's tests occupied 10 mins.

Mr. R. N. Thompson received his Royal Aero Club Certificate during the week. Most of the pilots and pupils of the Club will seriously study, during the forthcoming week, the notes on "Safe Flying," by Capt. de Havilland.

The Members of the Club have been very kindly invited by the Directors of Messrs. Armstrong, Whitworth & Co. to attend two of their Lectures. The first, on Wednesday, January 27, by Major F. M. Green, O.B.E., Inst.C.E., F.R.Ae.S., on "Aeroplanes of the Past, Present and Future," and the second, on February 17, by Mr. L. S. Swinnerton Dyer, A.M.I.M.E., entitled, "Tanks and Dragons with the Army Manœuvres, 1925." Both lectures will be illustrated by lantern slides, and will be held in the Large Hall, Elswick Institute, Scotswood Road, Newcastle-on-Tyne, at 7.30 p.m.

### Yorkshire Light Aeroplane Club

On January 20 the club's newly-acquired aerodrome at Sherburn-in-Elmet, some 10 miles outside Leeds, was opened by Air Vice-Marshal Sir Sefton Brancker, Director of Civil Aviation. Prior to the actual opening ceremony on the aerodrome a luncheon was held at Leeds, at which the Lord Mayor, Mr. John Arnott, who was accompanied by the Lady Mayoress, presided, supported by Prof. Brodetski, of Leeds University and the chairman



OPENING OF YORKSHIRE LIGHT AEROPLANE CLUB: Sir Sefton Brancker, who opened the Club, the Lady Mayoress of Leeds, Capt. A. M. West (Club Instructor), and Mr. T. W. Stainford, M.P. for Leeds, standing in front of the D.H. "Moth." Below, the Lady Mayoress, assisted by Gen. Festing, getting into the "Moth" for her first flight in an aeroplane



**OPENING OF YORKSHIRE LIGHT AEROPLANE CLUB :** Above, the D.H. "Moth" being brought out on to the Sherburn Aerodrome, prior to its first flight. Below, the "Moth" landing after its flight.

of the club, Mr. T. W. Stainford (M.P. for Leeds West), Mr. Eugene Ramsden (M.P. for Bradford North), and Sir Charles Wilson. There were also present many notable people, and, of course, members and officials of the club. In order to save time, and get out to the aerodrome as soon as possible, speeches were made during the lunch, and not afterwards—as is usual with functions of this character!

Sir Sefton Brancker said the light aeroplane movement was one of the most important moves in British aviation during the last few years. It was the Government's endeavour to encourage light aeroplane clubs with as little red tape and as little control as possible by giving financial support. There was no militarism about the movement; it was an effort to educate the nation to what aviation could do, and they intended to tackle the problem more from the commercial than the military side. There was a limit to the amount of help that could be given, and the Government wanted the light aeroplane clubs, of which there were now five, to fly on their own wings as soon as possible.

It lay with the youth of the country to raise aviation to the position in which it should be, but if developed steadily they might have an aircraft

industry in this country that would rival the old shipbuilding industry. He did not want to see other countries carrying our mails and passengers.

Sir Charles Wilson said if there was anything calculated to save the flying force it would be to link it up with commerce. They did not intend to let flying disappear from this country. He knew what a tremendous fleet of aeroplanes the French had, and how the Americans were increasing the number of machines, and if we did not have them we should one day find ourselves at a disadvantage. Flying in this country should be maintained at top hole, and if we made a mistake and let it go down it would be the easiest thing in the world for somebody to come along and wipe us out.

Luncheon over, all proceeded to the aerodrome, where the club's D.H. "Moth" was inspected, after which the club instructor, Capt. A. M. West made several flights on the machine, and took up a number of passengers including the Lady Mayoress, Mrs. Arnott, who thus made her first flight in an aeroplane.

At present the membership of the club numbers about 240—including three lady members—and it is hoped that a second machine will shortly be purchased to accompany the D.H. "Moth."

#### R.A.F. Honours

THE King has approved of the undermentioned rewards in recognition of gallant and distinguished service in the hinterland of Aden:—

Distinguished Flying Cross to Squadron Leader Robert Henry Magnus Spencer Saundby, M.C., A.F.C.; Distinguished Flying Medal to No. 330124 Leading Aircraftman Ernest Webb.

#### The Spanish Transatlantic Flight

IMPRESSIVE and picturesque scenes accompanied the start, on January 22, of the Spanish Transatlantic flight from Palos de Moguer (near Huelva, in South Spain), where, 434 years ago, Christopher Columbus set out on his famous voyage of discovery. In this latest venture, Comandante Franco (the pilot), Capt. Ruiz de Alda (navigator), and Lieut. Duran, of the Spanish Navy, accompanied by a mechanic named Rada, are attempting a flight from Spain to Buenos Aires in an Italian-built Dornier-Wal flying boat fitted with two 450 h.p. Napier "Lions." Their route is via West Morocco coast to the Canary Isles, Cape Verde Isles, Fernando Noronha, Pernambuco, Rio de Janeiro, and Buenos Aires. On the eve of their departure hundreds of people assembled at Palos to give them a hearty send-off, and all through the night intense excitement prevailed; special prayers were offered and masses said for their safety and success. A start

was made at 8 a.m.—the same hour at which Columbus sailed—and, after circling round the Columbus monument, the flying boat steered seawards just as the sun rose. The first stage of 812 miles to Las Palmas was safely accomplished in seven hours. Bad weather delayed them at Las Palmas until January 25, when they took off from Gauda Bay, Grand Canary, at 8.20 a.m., and at 7.50 p.m. they arrived at St. Vincent, Cape Verde Islands (900 miles), having kept in touch by wireless with the Port Etienne station (French West Africa) throughout the trip. We hope to give further details of this flight next week.

#### London—Cape Town Survey Flight

SINCE our last report on the London—Cape Town survey flight, Mr. Alan Cobham has experienced the worst part of the journey since he left London, for after leaving Tabora in Tanganyika on January 19 he had to fly over desolate forest country rising up to 5,500 ft. above sea level. The 285 miles between Tabora and Abercorn was, thanks to the reliability of the D.H.50-Siddeley "Jaguar" combination, accomplished without mishap—a forced landing would have been really serious—and on January 20 another 345 miles over more forest to the swamp-lake district of Bengwelo, as far as N'dola. Here a wait of two days was made for fuel supplies, and on January 23 a short stage of 110 miles to Broken Hill was accomplished.

# The AIRCRAFT ENGINEER

FLIGHT  
ENGINEERING  
SECTION

Edited by C. M. POULSEN

January 28, 1926

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## OUR CONTRIBUTORS

**Mr. F. Handley Page** will need no introduction to our readers, being one of the pioneers of British aviation as well as a prominent constructor of modern times. Of recent years Mr. Handley Page has, perhaps, become best known, at any rate abroad, for his invention of and work on "slotted" aerofoils. In the article which Mr. Handley Page contributes this week the subject of control at stalling speed is dealt with, and we may point out that the data given have never hitherto been published.

**Major F. M. Green** has for a number of years been associated with the Armstrong Siddeley and Armstrong Whitworth concerns as chief engineer. In the earlier days of aviation he was doing design work at the Royal Aircraft Factory at Farnborough, so that he has had a long experience in aircraft engineering. This week Major Green contributes an article dealing with the use of metal for aircraft construction.

**Mr. F. Sigrist** is probably one of the oldest members of the British aircraft industry (in the sense of his having been connected with aviation since the beginning, and not in actual years), having been intimately connected with Mr. T. O. M. Sopwith since 1910, and being now joint managing director with Mr. Sopwith of the Hawker Engineering Co. In the article which he contributes to our pages this week, Mr. Sigrist deals with the subject of design from the works point of view, a subject upon which he is singularly qualified to write.

**Mr. Oswald Short** is another pioneer of British aviation, having, with his brothers, started the aviation works bearing their name in the very beginning of British aviation. Since the war Mr. Short has devoted much time to the subject of all-metal, and particularly all-duralumin, construction, and his firm have evolved forms of construction in that material which strike out along entirely new lines. Moreover, Short Brothers were the first to build a British all-metal machine, and it is largely due to Mr. Short's efforts that the Air Ministry restrictions on the use of duralumin have been relaxed. In his article this week Mr. Short gives his reasons for choosing duralumin.

## TESTS ON AN AEROFOIL WITH TWO SLOTS SUITABLE FOR AN AIRCRAFT OF HIGH PERFORMANCE. (Lift, Drag, Rolling and Yawing Moment Measurements.)

By F. HANDLEY PAGE F.R.Ae.S.

The results that are described in this article form a complete series of tests on an aerofoil fitted with front and rear slots, the rear slot being formed between the portion of the plane aft of the rear spar and the forward portion of the flap. The section on which these tests were carried out is one that is suitable for a machine of high performance, and is, in the slot closed position, a slight variation of RAF/15, the camber being increased to accommodate rather larger wing spars than are possible with RAF/15 section.

The main characteristics of the unslotted section are similar to those of RAF/15, namely, a maximum lift coefficient of approximately 0.5 with a fairly low minimum drag, and a reasonable movement of the C.P. Slotted, the lift coefficient is increased to 0.8, and with the rear slot open and the flap inclined at 20° angle of incidence, the lift coefficient is increased to 1.

Here, then, are comprised the very desirable characteristics of RAF/15 when the slot is closed, together with a lift coefficient of 1 with slot open.

In addition to the data on lift, rolling and yawing moments have also been measured, when the front slot is used differentially to vary the lift on one side or the other of the planes, and so aid lateral control.

The outline of the section is shown in Fig. 1, and the ordinates in Table 1.

Table 1.

H.P. Aerofoil A.1.

(Ordinates given as fractions of the chord.)

Distance from Leading Edge.	Height of Upper Surface.	Height of Lower Surface.
0	0.0143	0.0143
0.01	0.0297	0.008
0.02	0.0385	0.005
0.03	0.0451	0.003
0.04	0.0495	0.002
0.05	0.0539	0.001
0.06	0.0572	0.001
0.08	0.0627	0.000
0.12	0.0693	0.001
0.16	0.0726	0.003
0.22	0.0748	0.006
0.30	0.0737	0.008
0.40	0.0715	0.008

Table 1 (continued.)

Distance from Leading Edge.	Height of Upper Surface.	Height of Lower Surface.
0.50	0.0682	0.006
0.60	0.0616	0.002
0.70	0.0528	0.000
0.80	0.0440	0.001
0.90	0.0319	0.003
0.95	0.0253	0.005
0.98	0.0187	0.006
0.99	0.0165	0.007
1.00	0.0110	0.0110

Construction of Auxiliary Aerofoil.

(Ordinates given as fractions of the chord.)

Distance from Leading Edge.	Height to Under Surface.	Height to Top Surface.
0	0.0143	0.0143
0.01	0.0278	0.0297
0.02	0.0360	0.0385
0.03	0.04275	0.0451
0.04	0.04780	0.0495
0.05	0.0520	0.0539
0.06	0.0560	0.0572
0.0702	0.05975	0.05975

Horizontal thickness at 0 dist. from l.e. = 0.001735.  
Chord of auxiliary aerofoil as fraction of the chord = 0.0834. Gap of front slot as fraction of chord = 0.025.  
Forward extension of auxiliary aerofoil for front slot open as fraction of chord = 0.0668.  
Leading edge of auxiliary aerofoil on chord line.

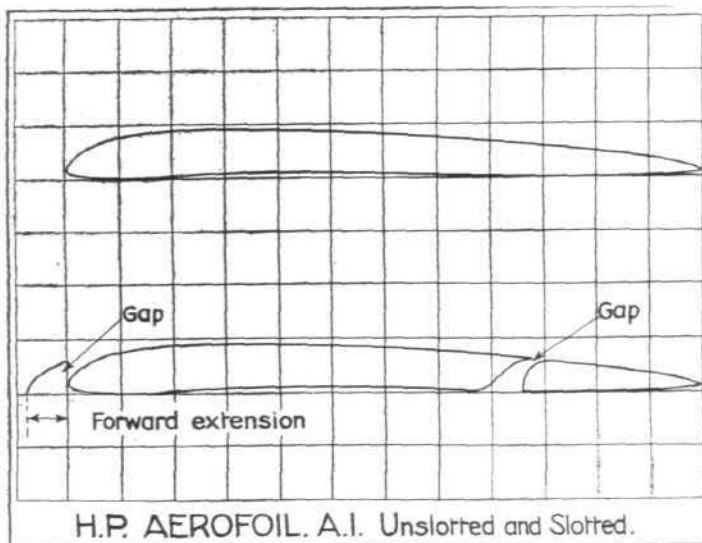


Fig. 1.

The opening of the forward slot is effected by moving forward the auxiliary aerofoil on links pivoted within the leading edge. With slot closed the aerofoil is of standard RAF/15 section. With slot open the chord of the aerofoil is increased by the amount which the aerofoil moves forward.

Construction of Rear Slot.

(Ordinates given as fractions of the chord.)

Distance from Leading Edge.	Height of Ordinates for Front of Rear Slot.
0.643	0
0.660	0.0039
0.666	0.00777
0.674	0.0136
0.680	0.0206
0.687	0.0271
0.694	0.0347
0.701	0.0403
0.708	0.0446
0.715	0.0479
0.722	0.0499
0.729	0.0506
0.735	0.0508

Distance from Leading Edge.	Height of Ordinates for Nose of Rear Flap.
0.713	0
0.720	0.0264
0.726	0.0361
0.734	0.0415
0.740	0.0444
0.747	0.0462
0.754	0.0471
0.761	0.0472
0.768	0.0466

Gap of rear slot as fraction of the chord, 0.00835.

This section has been tested at Cricklewood in the Handley Page tunnel, both unslotted and slotted; the results for the

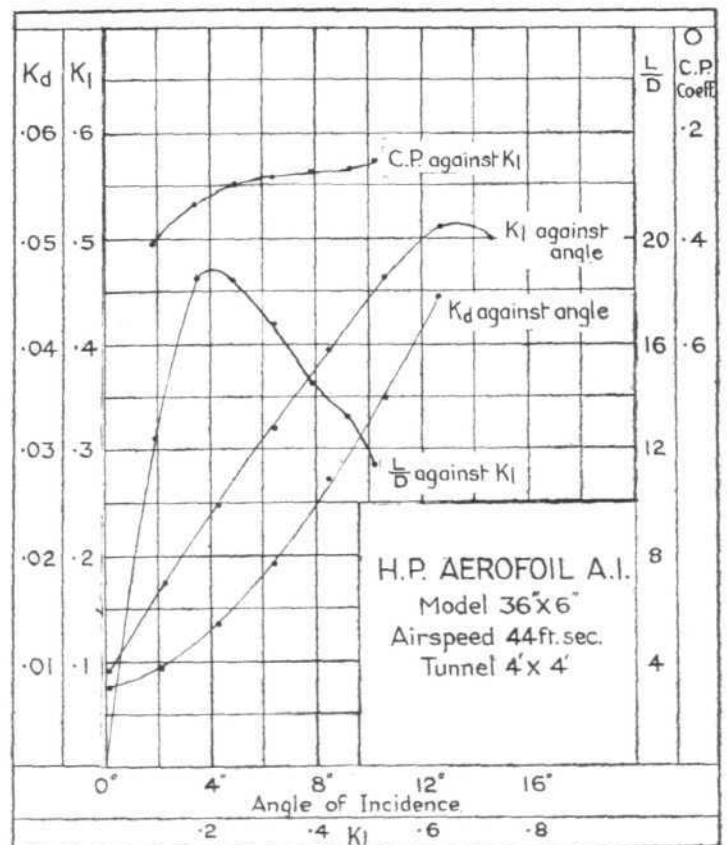


Fig. 2.

unslotted section are given in Table 2 and Fig. 2, so that a direct comparison may be made with the slotted section.

The tests were made in a 4-ft. square tunnel on a 36-in. span model. Corrections have been made for tunnel restriction to the drag coefficient and angle of incidence.

Table 2.

H.P. Aerofoil A.I. (Unslotted.)  
Model—36 in. by 6 in. Airspeed—44 ft./sec.

Angle of Incidence.	$K_l$	$K_d$	$\frac{L}{D}$	C.P. as fraction of chord.
0.135	0.092	0.00742	12.4	0.405
2.257	0.175	0.00948	18.5	0.334
4.364	0.248	0.0135	18.4	0.299
6.470	0.320	0.01905	16.8	0.285
8.581	0.396	0.02725	14.5	0.278
10.68	0.463	0.0349	13.25	0.271
12.75	0.51	0.0446	11.4	0.259
14.735	0.50	—	—	—

The section tested with front slot and slotted flap, the flap being set at different angles, gave exceptionally good results. The maximum  $K_{lc}$  obtained was 1.0, so that the total increase in lift is 98 per cent.

The expressions  $K_{lc}$ ,  $K_{dc}$  and C.P.<sub>c</sub> are symbols adopted to show that the coefficients have been calculated on the "slot closed area," and in the case of C.P.<sub>c</sub> the fractions of the chord are given from the leading edge, when the slot is closed.

These symbols only apply to this type of slot where the auxiliary aerofoil is moved in a forward direction to open the slot and backwards to close it.

## THE AIRCRAFT ENGINEER

Table 3 and Fig. 3 give the results of the section with front slot and slotted flap with different flap angles.

Table 3.

H.P. Aerofoil A.I.

Model ...	...	...	36 in. by 6.4 in.
Chord, slot closed ...	...	...	6.0 in.
Gap of front slot ...	...	...	0.15 in.
Gap of rear slot ...	...	...	0.05 in.
Airspeed ...	...	...	44 ft./sec.

Flap angle 0°.

Angle of Incidence.	$K_{1c}$	$K_{dc}$	$\frac{L}{D}$	C.P. as fraction of chord.
0.092	0.0585	0.0166	3.52	0.557
4.30	0.191	0.0237	8.06	0.325
8.57	0.367	0.0309	11.86	0.281
12.84	0.535	0.0503	10.61	0.270
17.06	0.679	0.0750	9.05	0.264
21.23	0.788	0.1109	7.11	0.253
23.27	0.806	0.1344	6.0	0.258
25.2	0.763	0.1568	4.86	

Flap angle -10°.

0.39	0.249	0.0239	10.4	0.465
4.66	0.421	0.0382	11.0	0.382
8.92	0.585	0.0559	10.48	0.337
13.17	0.748	0.0798	9.37	0.305
15.27	0.810	0.0976	8.30	0.300
17.37	0.875	0.1125	7.77	0.285
19.40	0.890	0.1352	6.57	0.292
21.41	0.897	0.1543	5.80	
23.37	0.874	0.1764	4.95	
25.17	0.846	0.2190	3.86	

Flap angle -20°.

Angle of Incidence.	$K_{1c}$	$K_{dc}$	$\frac{L}{D}$	C.P. as fraction of chord.
0.67	0.428	0.0466	9.20	0.618
4.91	0.590	0.0641	9.21	0.470
9.18	0.751	0.0895	8.38	0.410
13.41	0.898	0.1196	7.51	0.330
15.51	0.965	0.1376	7.01	0.334
17.57	0.999	0.1583	6.31	0.318
19.54	0.983	0.1690	5.22	0.315
21.43	0.970	0.1892	5.11	
23.39	0.942	0.2290	4.11	
25.30	0.885	0.2610	3.39	

From this table it will be seen that the lift coefficient of approximately 1 is obtained at a reasonable angle of incidence, namely,  $17\frac{1}{2}^\circ$ . As the angle of incidence is practically unaltered from that of a normal machine no difficulties arise in the use of this section in respect to the attitude of the machine on alighting. Where the maximum lift is obtained at a very large angle of incidence it would be necessary to employ an unduly high undercarriage, or to set the planes at an excessive angle of incidence on the fuselage, so that at top speed the machine would fly very tail high.

High lift having been obtained with the section, it is necessary to incorporate in the design full lateral control at this high lift, otherwise, whilst the results are of academic interest, full advantage could not be taken of them in practice, as the pilot would have to fly at a higher speed in order to obtain lateral control. There are many ways in which the control can be obtained. One method is slightly to reduce the angle of the flap for lift purposes and use a maximum angle of, say, only  $10^\circ$ , using the further movement of  $10^\circ$ —or a total of  $20^\circ$ —for lateral control purposes, and on the other side pulling up the flap to  $-20^\circ$ .

The rolling moment which is obtained can be estimated approximately from the difference in the lift coefficient of the two sides of the wing under these conditions. On the one side, with an angle of incidence of approximately  $20^\circ$ , the maximum lift coefficient is approximately 1. On the other side, with the aileron pulled up to  $-20^\circ$ , the lift coefficient with slot open was 0.54 (the results with the flap at  $-20^\circ$  are of minor importance and have therefore been omitted

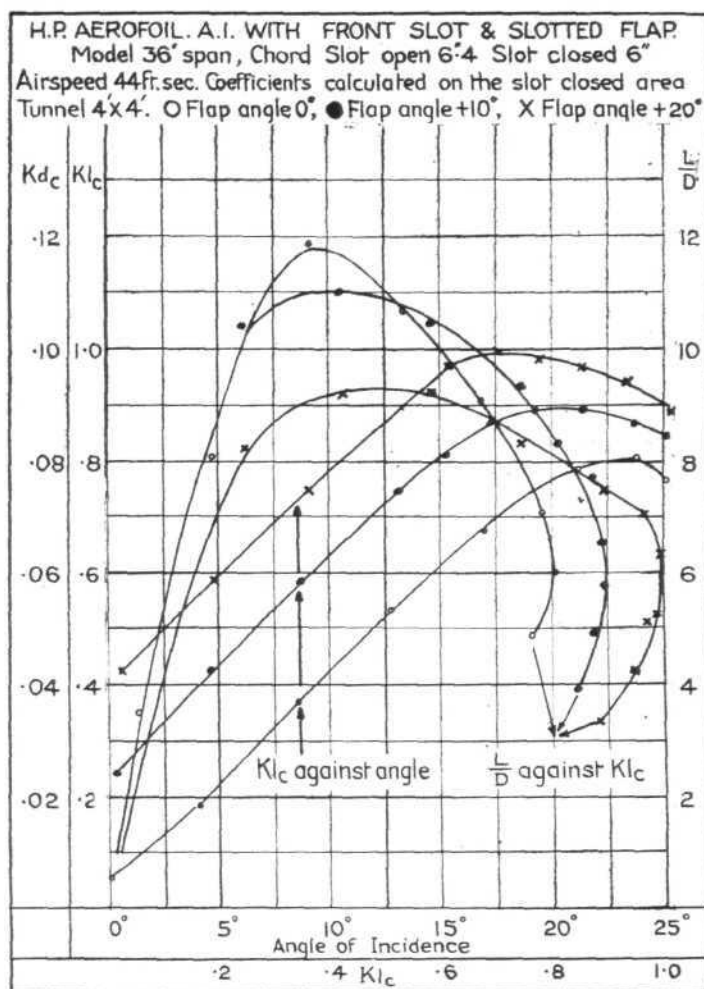


Fig. 3.

from this article for the sake of clearness). There is thus a difference in lift coefficient of 0.46, which is available to provide the necessary rolling moment. Similar results were obtained on the same section with front slot closed and the ailerons moving an equal amount, namely, to  $+20^\circ$  on one side and  $-20^\circ$  on the other, the difference in lift coefficient being approximately 0.3. The rolling moment for the slotted machine is therefore superior to that of the standard machine. The yawing moment in the case of the slotted machine is slightly worse, due to the heavy drag on the ailerons set at  $+20^\circ$ .

In this first method of obtaining lateral control, the lift is slightly increased on one side and considerably decreased on the opposite side.

A second and better method of control is that in which aileron and front aerofoil work in conjunction with one another. This method has already been fully explained in various Technical Memoranda issued by the Aeronautical Research Committee, and the Nos. of the Reports dealing with this are given at the end of this article. This system of slot control is of a different variety when the main slots are closed to that when the main slots are open. In an unslotted machine lateral control at and below the stalling speed is provided by opening the forward slot by a downward movement of the aileron, whilst the slot on the opposite side remains closed with the upward aileron movement.

With the main slots open an upward movement of the aileron closes the forward slot, whilst the slot on the opposite side remains open.

The difference in lift coefficient on the two sides is now much greater. If the same aileron angles as in the previous case are taken, the lift coefficient with the ailerons at  $-20^\circ$  and the slot closed will be 0.4, and with the aileron  $+20^\circ$  and slot open, the  $K_1$  will be 1. The difference in  $K_1$  is 0.6, or approximately twice that obtained with the ailerons alone. A further great advantage that is obtained is that the yaw is considerably reduced, and by a suitable arrangement of flap angle and slot can be made to act in the direction of the turn.

These figures are taken from a monoplane test.

For a complete biplane Fig. 4 shows Vector diagrams of rolling moments against yawing moments tested under four conditions:—

- (1) With no front slot, flap angle  $0^\circ$ , ailerons  $-20^\circ$  and  $+20^\circ$ .
- (2) With front slot open, flap angle  $10^\circ$ , ailerons  $-5\frac{1}{2}^\circ$  and  $+26^\circ$ .
- (3) With front slot open, flap angle  $+10^\circ$ , ailerons  $-20^\circ$  and  $+20^\circ$ , with a portion of the front slot equal to the span of the aileron closed on the side with the ailerons  $-20^\circ$ .
- (4) With front slot closed and flap angle  $0^\circ$ , ailerons  $-20^\circ$  and  $+20^\circ$ , with a portion of the front slot open on the side with the aileron at  $+20^\circ$ .

In comparing these different cases, a point of particular interest is the improvement in control of the slotted machine over the standard type when both are fitted with slot and aileron working in conjunction with one another.

The result of the use of this section for the design of an aircraft can readily be seen. Unslotted, the section has a lift coefficient of  $0.51$  at  $12\frac{3}{4}^\circ$ ; slotted, the maximum lift coefficient is  $1$  at an angle of  $17\frac{1}{2}^\circ$ . For the same landing speed, therefore, a slotted wing machine with this section could have double the loading of the unslotted type. Alternatively, with the same loading the landing speed would be reduced approximately 70 per cent. Most important of all

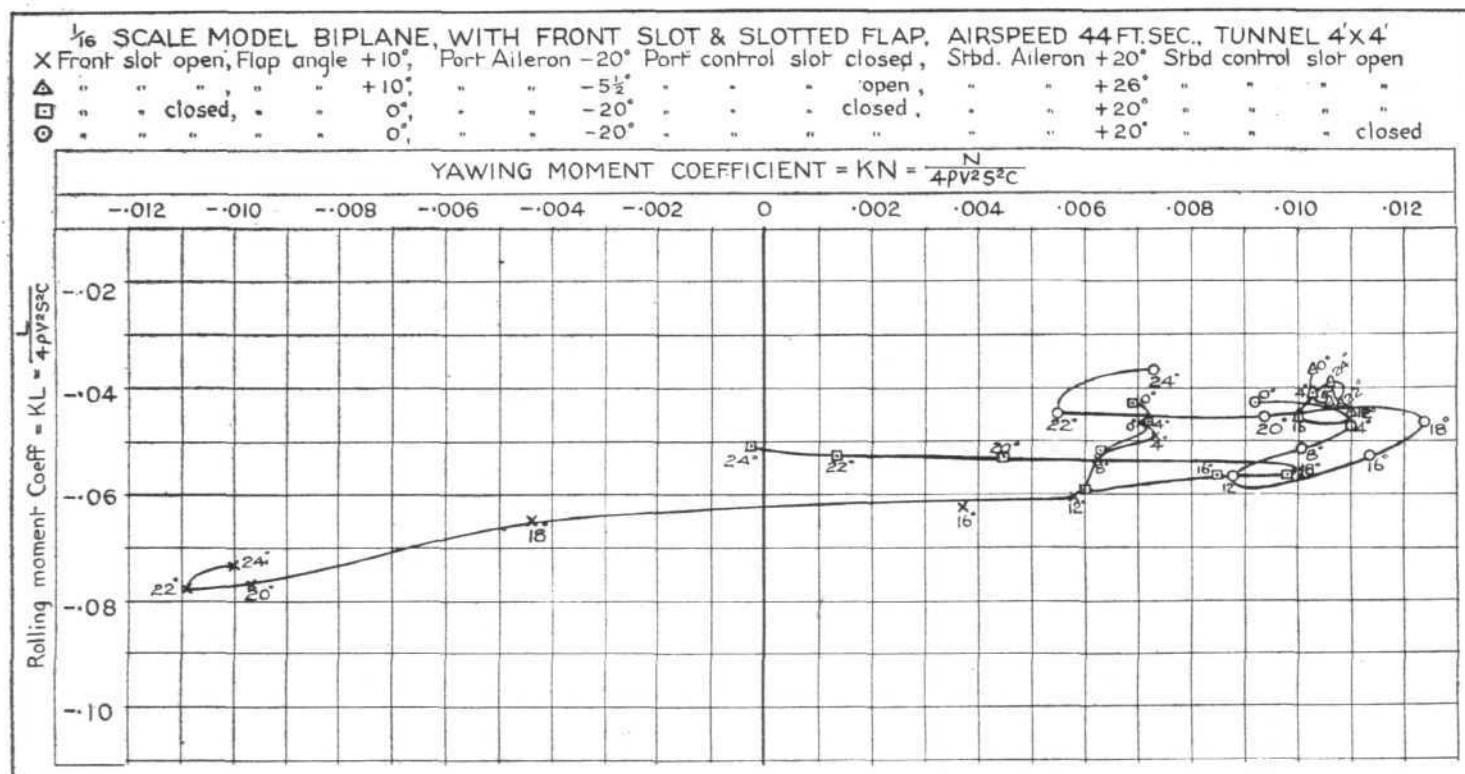


Fig. 4.

Rolling moments and yawing moments are given in coefficient form and are in relation to body axis. The tests are directly comparative and can be taken as a true indication of the advantages to be gained from "slotted control."

Reviewing these tests, Case No. 1 represents an unslotted biplane with slotted ailerons at  $\pm 20^\circ$ . The results in Fig. 4 show that the rolling moment increases from  $4^\circ$  up to  $12^\circ$ , then diminishes, and the yawing moment attains maximum at  $18^\circ$ . Thereafter there is a diminution in yawing moment accompanied by a slight diminution in rolling moment. This is a distinct improvement on the ordinary type of aircraft without slotted ailerons. This curve is plotted with the points at the different angles marked in the centre of a circle.

Case No. 2 is shown on the curves with the points enclosed within triangles. Here again the rolling moment even at  $24^\circ$  is considerable, showing the improvement obtained by using slotted ailerons, the front slot in this case being open the whole way along the span.

Case No. 3 is that of a slotted machine in which the slotted ailerons are used in conjunction with the forward aerofoil. The results are shown on the curve in which the points are marked by crosses. It will be observed that the yawing moment even at small angles is less than that in the other cases, and that from  $16^\circ$  it becomes rapidly negative, assisting the machine in the direction of the turn. With increasing angle also the rolling moment is increased, the rolling moment at  $22^\circ$  being nearly  $0.08$  against a rolling moment of approximately  $0.045$  at  $0^\circ$ .

Case No. 4 shows a similar result with front slot closed, the results being somewhat similar to Case 3. The points are indicated on the curves in squares. It will be seen that the rolling moment remains practically stationary, although the yaw at  $4^\circ$  has vanished.

is the great increase in lateral control at the stalling speed. Attention is particularly drawn to Case No. 3, plotted on Fig. 4, in which a very big yawing moment helping the turn is obtained by the use of the slot and aileron control.

Tests on the full scale with this section will shortly be carried out. Tests both for lift coefficient and rolling moments on a completely slotted machine with a loading of between 12 and 13 lbs./sq. ft. with a slightly different section have given confirmatory results on the values of the lift as well as rolling and yawing moments. The mechanical details present no difficulties in construction. The forward aerofoil is made out of a single Duralumin plate carried on links from the front spar. Closed, the aerofoil rests against the leading edge and the section is a standard unslotted one. It is hoped that photographs and details of this may be published in a later article.

#### USE OF METAL FOR AEROPLANE CONSTRUCTION.

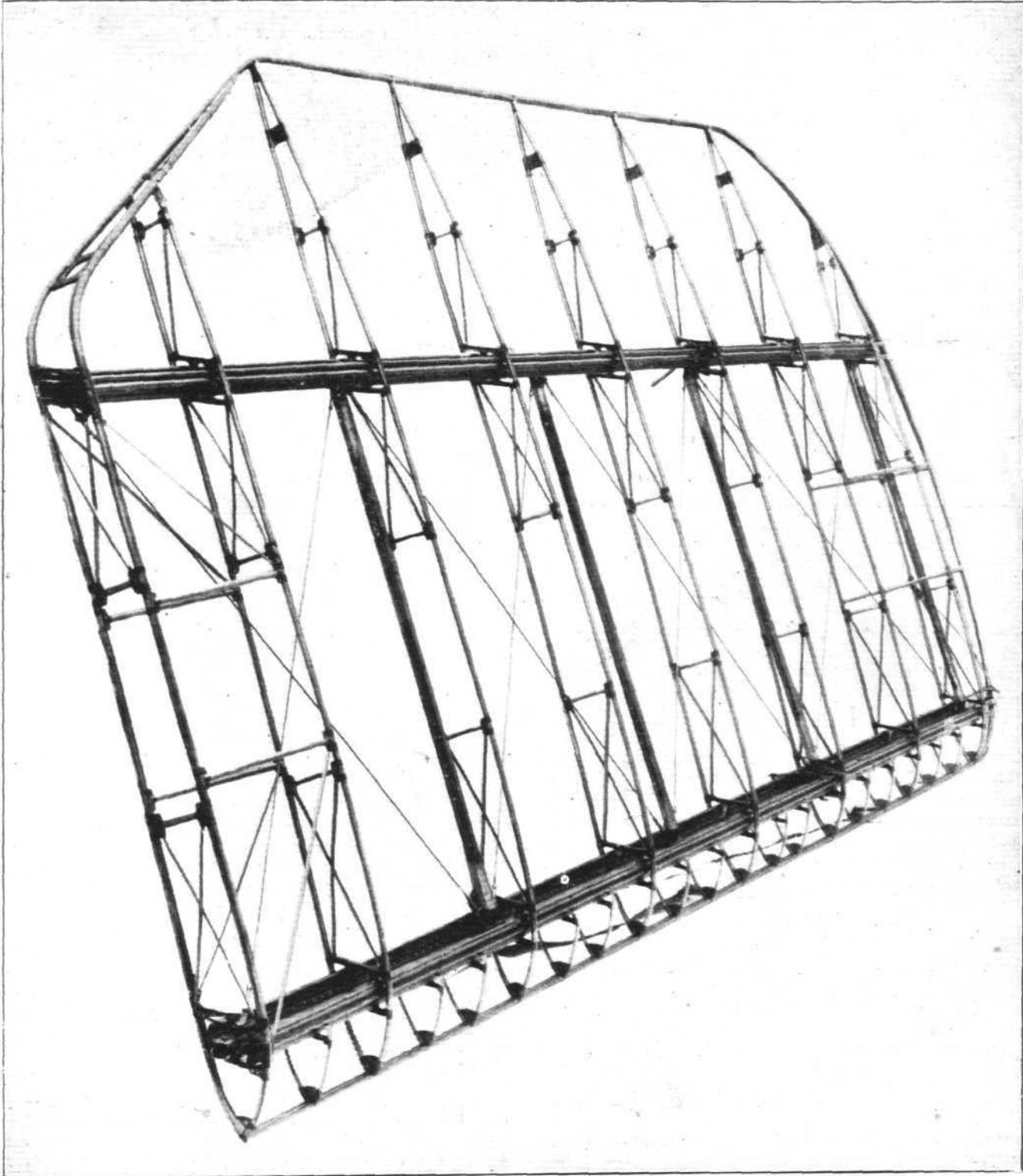
By F. M. GREEN, M.Inst.C.E., F.R.Ae.S.

In the early days of flying the problems of aerodynamics so occupied the experimenter that he paid little attention to the finer points of construction. Materials that were easy to obtain and quick to work up were used, and as a consequence practically all the first aeroplanes were made of wood with a minimum of metal fittings. It was soon discovered that silver spruce could be obtained at a low price as there was very little other use for it, and that this kind of timber had the maximum advantages for aeroplane construction. Its specific strength was high, it could be obtained in long pieces, and it is very straight-grained. Other forms of timber were used, and some of the early machines were made of bamboo. While this wood possesses the advantage of being hollow, it is difficult to join, and from the nature of the wood it would be impossible to make aeroplanes to drawing without using

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very wide limits. To the engineer, wood was an unusual material to use in places where it is highly stressed, and methods of calculation based on ordinary engineering practice had to be devised. The technique of design grew up very rapidly indeed, until at the present time there seems to be little chance of making a lighter structure for a given strength. The great convenience in the use of wood is that its low density enables comparatively thick sections to be used.

therefore, natural that the engineer turns to manufactured materials in which the process of manufacture can be regulated throughout all its stages. Good manufacture will ensure a uniformity which is completely out of the question in wood. Further than this, the physical properties of metals are continually being improved, and the limit of strength is probably a long way from being reached. Again, if reasonable precautions are taken, a structure can be made in metal that



**ALL-METAL AEROPLANE WING :** With spars of corrugated steel strip, riveted together, and ribs of tubular construction, this wing was constructed by the Armstrong-Whitworth Company in 1920.

From time to time suggestions have been made for the use of hollow wooden members built up of thin sections glued together. Unfortunately, the only practical method of joining wood together is by glueing, and it has been found in practice that the life of a wooden wing is the life of the glue. This makes the use of glued members for the main structure undesirable, as for reasons of safety a wing has to be scrapped as soon as the strength of the glued joint is in question.

Wood being a natural product, it is not possible to influence the strength and reliability to any marked extent, and it is,

is unaffected by change of climate, and which will retain its strength and shape indefinitely.

The material that is used for the construction of metal aeroplanes is either steel in its various forms or one of the light alloys, the basis of which is generally aluminium, but which may in the future be magnesium. As the majority of aeroplanes are made for the purpose of war, it is of the utmost importance that the material chosen shall be one which can be obtained in the country in which the aeroplane is built. In this country steel is far more suitable than an aluminium

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alloy. France, on the other hand, which is a large manufacturer of aluminium, has developed its metal construction almost entirely by the use of aluminium. Both steel and aluminium alloys have their own special advantages, and it is a difficult matter to decide which has the best chance of producing the lighter and more reliable structure. Both materials are likely to be improved considerably in the future, and it is not possible to say which will develop the faster.

It is always a difficulty in engineering to know what is the safe stress to which a material can be worked. Aeroplanes, unlike any other structure, are calculated on their ultimate strength, and not on a factor of safety on the normal load, as is usually the case. It appears at first sight that, as the aeroplane is calculated on its ultimate strength, it will be safe to use the ultimate strength of the various materials employed. Whether this is safe or not depends to a considerable extent on the type of material under consideration. It has been common practice to design mild-steel fittings on their ultimate strength, and the results seem to justify the practice. With heat-treated steels it is quite certain that the results will not be equally safe. It is certainly not necessary to work to as low a stress as is given by the limit of proportionality, neither is there any particular justification for taking the yield-point. As there seemed to be no scientific reason for settling the stress, it was necessary to find a practical method which agreed with observed results, and a stress known as the "proof stress" has been adopted. "Proof stress" is defined as that at which the strain is not greater than the elastic strain by more than a small amount. It must be clearly understood that the proof stress is merely a method of testing steel, and that its use can only be justified by practical experience. What we really want to know is the compressive strength of thin strip, and there is no practical method of measuring it. It is assumed that this bears a close relationship to the tensile strength, and, while this is not absolutely true, it certainly seems to give us a fairly good basis.

We are now in a position to make comparison of the three materials. It must be remembered that the comparison cannot be expressed exactly by a series of figures without reservation, as there are a number of other factors of which no account is taken. In an aeroplane structure there are usually a large number of comparatively long members in compression, and the strength of these depends largely upon the modulus of elasticity of the material used. This figure is curiously constant for steel of almost every kind, and can be taken as 29,000,000 lb./sq. in., while for Duralumin it is 12,000,000 lb./sq. in. For spruce the figure will vary from 1,100,000 to 1,900,000 lb. per square inch. The latest specification gives a value of 1,500,000 as a minimum.

Material.	Max. Stress, tons/sq. in.	Spec. Gravity.	Relative specific strength.	Mod. of Elas.	Relative specific stiffness.
Sitka spruce ...	2.24	0.45	0.71	1,500,000	0.86
Steel strip ...	55.0	7.85	1.00	29,000,000	0.96
Duralumin ...	14.5	2.85	0.73	11,000,000	1.00

The maximum stress for spruce is taken as 5,000 lb./sq. in. This is the figure for compression, the tension figure being considerably higher. As in practically every case the failure of a wooden member is by compression, this is a fair figure to take. The maximum stress for the steel and Duralumin is taken from the proof stress. It may be objected that a figure of 14.5 tons/sq. in. is rather low for Duralumin. This has been taken from a standard specification. It is probable that other light alloys might give better figures than this, but the same may be said of steel, and the figures used are meant to represent material that can be obtained commercially in quantity, and at a reasonable price. In the table given, the principal characteristics of the three materials are summarised. The fourth column gives a comparison of a relative strength for a given weight, and the last column the relative

elasticity modulus, also on a weight basis. If the specific strength of steel is 1, then Sitka spruce is 71 per cent. as strong, and Duralumin 73 per cent. The last column can best be described as relative specific stiffness, and in this case Duralumin is slightly better than steel, and spruce not very much behind.

The conclusions from this table are, other things being equal, strip steel of 55 ton proof stress will make the lightest aeroplane of a given strength. This conclusion will only hold good if it is possible to arrange that the strip steel can actually develop a high percentage of its full proof stress. In tension this is a simple matter, but in compression owing to the thinness of the strip that must be used, it is only possible to develop the full proof stress when special precautions are taken to stiffen the section against secondary failure or "crinkle." Luckily this problem has proved capable of solution, as it has been found that longitudinal corrugations suitably arranged enable strip steel sections as thin as 12-thousandths of an inch thick to be stable under a compression stress exceeding the 55 tons per square inch.

At the Aero Show held in Paris in December of last year, it was interesting to notice that the Duralumin constructions, which were largely exhibited, were frequently made up of flat Duralumin strip. In certain cases the web was embossed, in other cases the flanges were corrugated. As the stress to which the Duralumin can be worked is comparatively low and the sections used are thicker, the need for stiffening the sections against secondary failure is not so urgent. The spars with no stiffening were mostly for planes with little or no bracing, while corrugations were used for spars in braced biplanes, in which more weight was put into the bracing and less into the spars themselves.

Theoretical considerations are of little value until they are confirmed by practice. Six years ago we could not have answered the question as to whether it was commercially possible to produce aeroplanes in metal as light and as strong as in wood. Today there are several standard aeroplanes in France made chiefly of Duralumin, notably the Breguet XIX, and in our own country the firm with which the writer is connected is manufacturing steel fighting aeroplanes in series for the Air Ministry. That the Breguet has a comparatively light structure weight is well known, and it is possible to say that "Siskin III" is no heavier than the lightest wooden aeroplanes made to a comparable specification.

Three years experience of Service flying has not shown any troubles that are peculiar to steel construction, while the expectation of increased durability, due to a stable material, has been justified. The minor troubles of warped trailing edges and twisted spars are unknown, and it is comforting to know that spare planes can be stored indefinitely without risk of deterioration. There is no doubt a valuable store of experience of Duralumin aeroplanes abroad; in this country it is limited to a number of experimental aeroplanes, but it would be interesting to hear from the constructors and users as to the success of the construction. Steel we have used in all kinds of engineering for a long time; the lighter alloys scarcely have the same experience behind them, and we need to add to this experience the collective reports of as many constructors and users as possible.

Hitherto, most of the aeroplanes that have been made in metal have been of comparatively small size. The sections used in this construction have, therefore, been light, and this has added a great deal to the designers' troubles. Rib in particular have been found much more difficult to design than spars. It certainly is easier to make a rib in an aluminium alloy than in steel, as it is not at all easy to develop a high stress in the very light steel sections that must be used, and the writer has often been tempted to take the easier path. Greater confidence in the reliability of steel, and the fact that in the case of war it will be much easier to obtain, encouraged the intensive development of this particular unit, and a solution has been obtained.

One lesson we have learnt, and it has become more and more obvious as manufacturing developed. The lesson is the need for making up a wing in such a way that all components can be finished separately and erected quickly into a complete

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wing. The saving of floor space alone would justify the rejection of a design in which the ribs had to be built up in place. Apart from the saving of space, we have found it essential that all rivets should be closed under a press, and it is not easy to handle a partly completed wing so that rivets can be brought under a fixed press. In early designs portable rivet presses of various types were used, but one awkwardly-placed rivet often took as long to close as 50 which were more straightforward. In modern designs, spars and ribs are finished as units, and are fastened one to the other without the use of rivets. Leading and trailing edges are clipped to the ribs without rivets or bolts, and the whole assembly is easy to erect and easy to repair.

In the course of this article it is not proposed to go into detail methods of construction. Progress has been possible only by the closest co-operation between the drawing office and the shops, and it is only by the experience of making steel aeroplanes in series that the gradual improvement in type has been effected. We may perhaps be allowed to congratulate ourselves that it is in England that the steel aeroplane has found its first practical expression, and that our own fighting service is the first, and at present the only, Air Force, to be equipped with steel aircraft.

## DESIGN FROM THE MANUFACTURING POINT OF VIEW.

By F. SIGRIST, M.B.E., A.F.R.Ae.S.

From 1910 to 1926 is a long span in the Aircraft Industry and represents a period in which evolution has accomplished considerable progress in the science of aerodynamics and aircraft design, but I occasionally wonder whether we have progressed from the manufacturing point of view in the same ratio, and on the whole I am inclined to think that the answer is in the negative. It must be borne in mind, however, that a concatenation of circumstances have mitigated somewhat against the manufacturing position in recent years. During the Great War, it was possible to utilise expensive jigs and tools to the fullest advantage and useful designs did not materialise so rapidly as they have since.

Taking the period 1919 to 1925, both engine and aircraft design have vastly improved in comparison with the 1914-1918 period; so much so that design may be said to have been more or less in a state of flux, continuous research and resultant improvements aerodynamically rather tending to occupy the designers' mind to the exclusion of the manu-

from any other grade of engineering, and embraces so many varied vocations that I consider it almost essential for the D.O. man to have received a course of training in a practical aeronautical construction shop.

## Co-operation.

I have found by long experience, that close co-operation between the designer, works engineer, and inspector is of the utmost importance in successful aircraft design, and regular consultations between these departments has done much to simplify our own designs, with consequent economy of manufacture and increase of output, but without minimising in the slightest degree the aerodynamical efficiency or performance of the finished product.

Standardisation for the whole industry is of course impossible beyond a certain point, *i.e.*, material specifications, A.G.S. parts, instruments, electrical equipment, &c., and this point having been reached, it remains for individual concerns to effect such procedure as may seem desirable to assist manufacture from their own standpoint. Circumstances of course vary to some extent with each separate firm, and in a brief résumé it is impossible to consider thoroughly such items as machinery, equipment, and scientific costing, but rather to the contrary, the question must be dealt with on broad outlines.

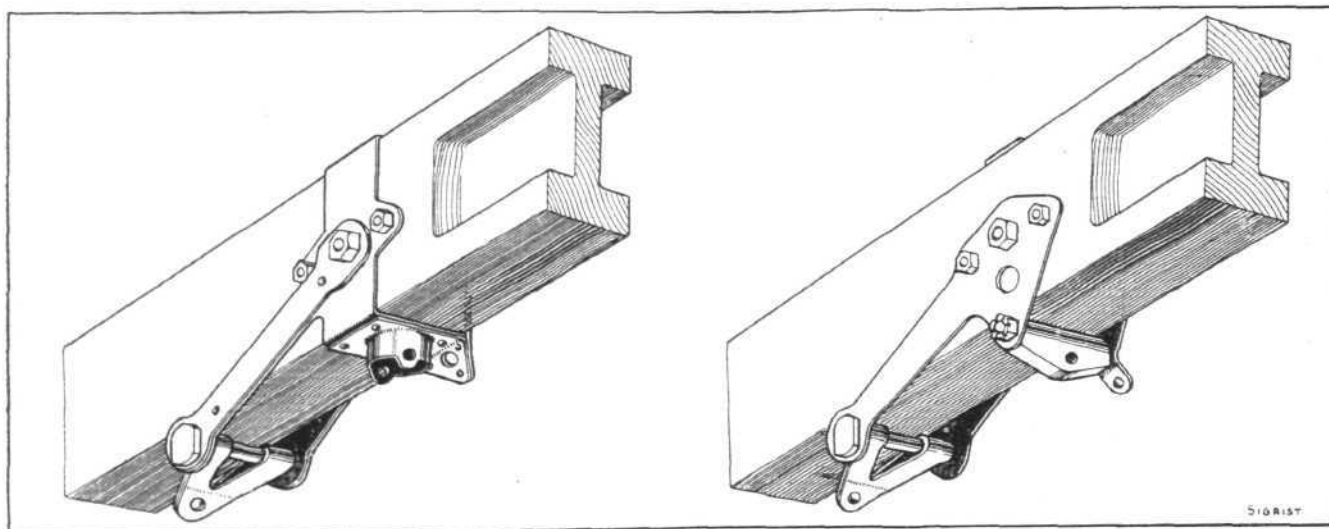
Where the manufacturer is concentrating on machines of the same type, say single-seater fighter machines only, or day-bombing machines only, the task of the designer is simplified, as he can nearly always arrange to use the same metal fittings on type II as on type I. but where, as in my own case, the manufacturer is engaged on two or three different types of machines, the designer is up against a difficult proposition.

## Sheet-Metal Fittings.

Sheet-metal fittings offer scope for saving, particularly in the services of skilled labour. If the quantity required is sufficient to warrant the expense, press tools should certainly be employed, but the designer must remember that the indiscriminate use of these should be avoided, as the principle of their application is sometimes defeated. The considerations covering their use may be roughly classified in order of importance as—

- (A) Reduction in the cost of production,
- (B) Interchangeability,
- (C) Accuracy of manufacture,

and these should be carefully studied.



**SIMPLIFIED WING FITTINGS:** These sketches show, on the left, the original fitting and, on the right, the simplified fitting referred to by Mr. Sigrist.

facturing point of view. True, the numbers of each type of post-war machine in production have been comparatively small, but this fact, to my mind, emphasises the need for closer attention to manufacturing difficulties.

I have consistently advocated the point that the draughtsman should be in a position to appreciate exactly what is involved in the manufacture of the part he designs, as aeronautical engineering is, in many respects, rather different

Unfortunately, nowadays, orders are usually not of sufficient magnitude to justify the manufacture of press tools, but I have found, more particularly in the design of fuselage clips, that it is possible to evolve a fitting which can be blanked, bent, and utilised throughout the fuselage, provided some slight handwork in the shape of removing lugs is carried out where required on different points.

In the design of wing fittings a certain saving can be effected

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by careful thought. There is a tendency to produce a complicated fitting of light-gauge material, bent up and reinforced with plates and washers, riveted and brazed on, and lightened in a rather elaborate manner. Much work can be avoided if two simple flat plates of thicker gauge are used instead. The increase in weight is infinitesimal, but the saving in manufacturing cost is considerable. The flat plates can be nibbled out and filed up to template by unskilled labour, but the bent-up clip necessitates the use of bending blocks, skilled labour, and naturally takes a longer time to inspect. These instances can, generally speaking, be employed throughout the whole of the designing office. Simplicity is the keynote of successful design, and I am of the opinion that a certain amount of weight can be sacrificed without impairing efficiency to any appreciable degree, yet at the same time increasing ease of manufacture.

Riveting can be, and often is, carried to such an extent as to become an uneconomical process: lightening holes may seem trivial, but a saving can be made by careful design. Avoidance of complicated shapes and numerous small holes in hand-made fittings should be made a rule. Welding and brazing processes are useful up to a certain point, but it must not be overlooked that normalising must follow these operations, causing delay as apart from expense. The use of drop stampings, where quantities warrant the expense of dies, is a practice to be commended. Where a complicated profile is required on a machined fitting, a drop stamping will save considerable machining operations and simplify jigs and tools, beside conserving raw material.

#### High-tensile Materials.

The materials field affords many opportunities for the designer to assist the manufacturing side. I am not entirely satisfied with the use of high-tensile material. Undoubtedly, it possesses many advantages, and the designer, beset by the weight fetish, is sorely tempted to use it on every conceivable occasion, but in many instances the benefits to be derived are open to argument as to whether they are worth the expenditure. It is more difficult to work, and the heat treatment, apart from cost, necessitates test pieces and records, and careful following of batches through to shops to avoid confusion. With metal construction looming large in design, the use of high-tensile material is increasing, and, whilst certain features make it attractive, I am not convinced of its absolute superiority over other forms of metal construction. In the Hawker "Heron" I have refrained from using this steel, and have employed a mild-steel tubular construction throughout. I am not at liberty to enter into details, but I can say that the results from the cost and manufacturing point of view are startling, whilst the weight, strength, and performance figures are fully in accordance with expectations.

#### Duralumin.

The use of Duralumin to the best advantage is also open to question. Here again is another material which offers many attractions to the designer, but which presents manufacturing difficulties which detract somewhat from its good qualities. Our knowledge of the qualities of this material is not as complete as could be desired, and its use should be restricted wherever possible to plain fittings, where the minimum of working is required. Complicated bent fittings are to be avoided, as wherever the material is worked to any extent the heat treatment required is such that, apart from expense, it causes delay and often disorganisation, owing to the fact that it has to be repeated before the fitting is completed. In considering the non-ferrous metals, I think the designer is slightly handicapped by the necessity for adherence to specifications, but it is sometimes possible to obtain a concession to diverge. Constructors have experienced great difficulties in the past with sand castings, owing to blow-holes and porosity, and quantities have again not been sufficient to warrant the manufacture of dies. In the majority of cases the cause has possibly been due to inherent foundry trouble, but I have seen many instances where design has been at fault. The advantage of foundry advice when designing for castings is inestimable, and will result

in a considerable saving. Where I have had difficulties with gun-metal and bronze castings as regards porosity, I have utilised hot brass stampings as being cheaper than die castings, and more reliable than sand castings, and even on small quantities a saving is shown, as scrap is practically nil. A material which the designer rather neglects is malleable iron, which is extremely useful on secondary structures. I recognise its limitations, but I have utilised castings with great success on gun-mountings and under-carriage fittings. It is cheaper and stronger than aluminium, and for replacing made-up plate fittings in certain structures, it is much better, the scrap being negligible.

A point, seemingly small, but one which I have found responsible for many irritating delays, is the fact that the designer, when considering such things as tanks, cowling, &c., does not give due regard to the standard size sheet of material available, and it is necessary to obtain specially large sheets, which as often as not, apart from delay in procuring, results in large scrap pieces being left over from each sheet, a wasteful proceeding which could be eliminated by a little forethought in the drawing office. It is also advisable for the designer to keep to standard gauges of thickness wherever possible and to avoid deviations from makers' usual stock sizes. As regards the question of screw threads, the designer must consider each case individually, as this is not so much a difficulty as regards manufacture, but is rather a question of general economy. On these grounds it is better to concentrate on standard sizes, as every new thread introduced means an increase, not only in screwing tackle, but in gauges for both works and inspection departments. On the timber side, there is not so much scope for assistance from designer to manufacturer, but the former must keep constantly in mind the question of quality and sizes of planks available. Economy is more a matter for judicious selection by the works rather than consideration by the designer.

In conclusion I regret that I can only touch on the fringe of what must be generally regarded as a most important question. The growing popularity of the aeroplane, the increasing tendency towards economy, the world-wide demand which is coming sooner or later for the best in aviation—British aircraft—makes closer co-operation between the designer, manufacturer and inspector a matter of paramount importance. No one realises more than I the necessity for research and progress, and no one welcomes with more enthusiasm each innovation which furthers our knowledge, but the application of such knowledge must be tempered with that consideration for our manufacturing facilities which will enable us to utilise it in the most efficient and economic manner.

#### DURALUMIN AS A MATERIAL FOR AIRCRAFT CONSTRUCTION.

By OSWALD SHORT.

For the purpose of all-metal aircraft construction, we have at the present time a choice of two materials, viz., steel, and the aluminium alloy known as Duralumin.

Other light alloys are in course of development, but as they are still in a more or less experimental stage, they need not be considered in this article.

It is proposed under this heading to give the results of experience in the use of Duralumin for aircraft construction, and in some places to make comparisons between this metal and steel as regards their suitability for certain work.

The use of Duralumin in this country as the main material of construction for aeroplanes, etc., as distinct from lighter-than-air craft, dates from the years 1918-19, when Short Bros. produced an all-metal aeroplane in which this material largely predominated.

Briefly, this machine had a *monocoque* fuselage made entirely of Duralumin, and plane ribs and covering of the same material. The spars, struts, and bracing wires, and the chassis struts were of steel.

Previous to the building of this machine, no serious attempt had been made in this country to employ Duralumin for the construction of heavier-than-air craft, and this position was

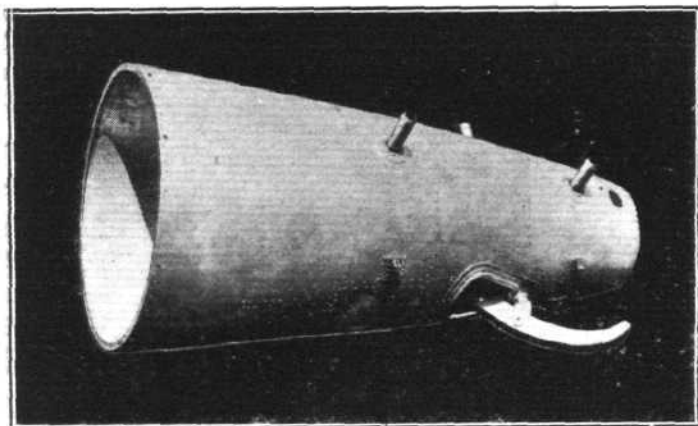
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undoubtedly due to the fact that the metal was, by most designers, considered to be inconsistent in its properties, and too liable to corrosion to justify its use in this connection. What, perhaps, was forgotten in this judgment of the material, was the possibility that such observed failings were not wholly inherent to the alloy itself, but due to improper treatment, both in the manufacture of the metal and in its working up afterwards.

Experience since gained in the actual construction of aeroplanes, etc., has shown that Duralumin can be relied upon, providing that it is given at least the same careful treatment as is meted out to the high-tensile steels which are used for the same purpose. The question might be asked; Why use Duralumin when it has been demonstrated that excellent machines can be made on an all-steel basis?

The answer to the question is that Duralumin is applicable to certain desirable forms of aircraft construction to which steel is not applicable, at least as far as our present knowledge is concerned.

For instance, it is peculiarly applicable to the building of an all-metal *monocoque* fuselage, and such a type of fuselage may be said to be a desirable form of structure, because it provides at once an excellent stream line form, an interior devoid of obstructions, and an ideal form to withstand torsional loads, such as may be applied through the tail plane, fin and rudder. Such a fuselage avoids the use of fabric covering, does not absorb water, and can easily be made airtight, or fitted with the simplest made watertight or fire-proof bulkheads. As a stream line form, it will maintain its shape against severe air pressures, and local pressures when on the ground. The photographs herewith show more clearly



Tail portion of a Short all-metal monocoque fuselage. The illustration gives an excellent idea of the cleanness of this form of construction.

than can be described the cleanness and simplicity of *monocoque* construction in metal.

Other desirable forms of structure, are *monocoque* flying boat hulls and seaplane floats. Indeed the *monocoque* system of construction is essential for such purposes, if the best results are to be obtained. It has been amply demonstrated that Duralumin hulls and floats are superior to wooden ones in that they are much lighter for a given strength and have the additional advantage that they do not absorb water, effecting a still greater saving in weight.

On the other hand, if we endeavour to make similar constructions of steel we are faced with great, and at present unsurmountable, difficulties. If steel were used in the same manner, because of the greater density of the metal, the plates, generally, would be too thin to suit the requirements of resistance to compression stresses, to say nothing of the difficulty of riveting the joints in such thin plates. In fact, if such structures are required to be constructed of metal, some form of light alloy is essential.

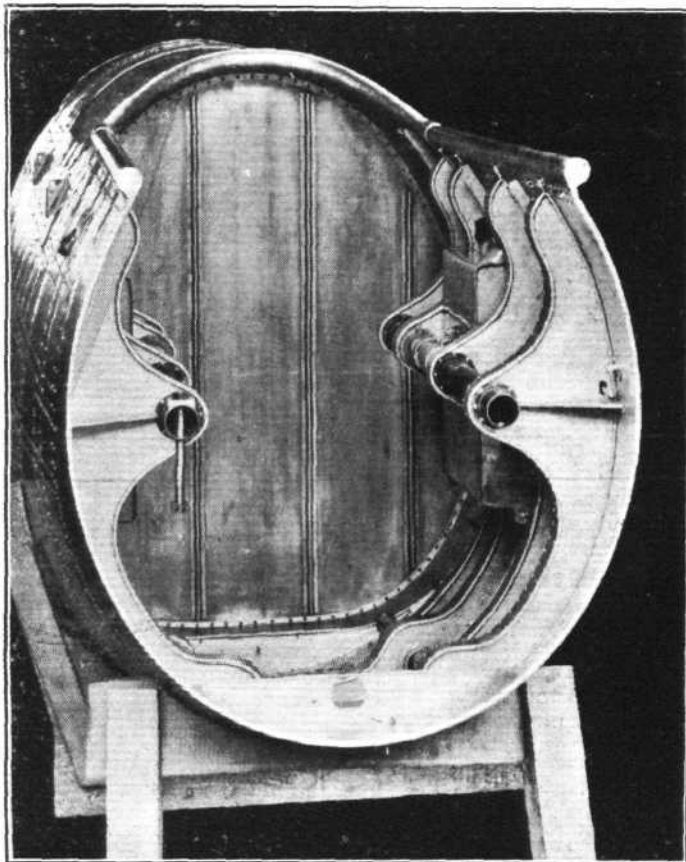
It is for this reason that many aircraft manufacturers in this country are now seriously studying the question of using light alloys in the manufacture of aircraft.

The following table shows the thickness of the Duralumin plating used by Short Bros. in the construction of their first

all-metal flying boat, which was laid down in the early part of 1923, and, for comparison, the thickness of steel plating of the same weight per square foot.

As Built in Duralumin.		Thickness in Steel of Same Weight.	
Steps 18 gauge	... .048 in.	.017 in.	26 gauge approx.
Bottom other than steps	... .028 in.	.010 in.	33 gauge approx.
Top	... .022 in.	.008 in.	35 gauge approx.

The second table shows in a similar manner the thickness of plating used by Short Bros. in the construction of the first large flying boat with all-metal hull, supplied to the Air Ministry and delivered in 1924. This machine flew with an all-up weight of nearly 14,000 lbs.



This section through a Short all-metal fuselage shows the neat interior and the cradles or bulkheads for carrying various equipment.

As Built in Duralumin.		Thickness in Steel of Same Weight.	
Steps and under water plating, 14 gauge	... .080 in.	.025 in.	= 23 gauge.
Remainder above water line, 20 and 22 gauge	.036 & .028 in.	.013 in. and .010 in.,	29 and 33 gauge approx.

It will be seen from this table that the greater weight permissible in the under-water plating of the larger hull indicates that steel might possibly be used there, although the equivalent steel plating is still so thin as to make this a doubtful project, especially where riveting is concerned. Also, it is evident that steel could not be used over the whole structure, and in this connection it must be borne in mind that it is not advisable to join dissimilar metals because of corrosive effects in the presence of salt water.

For the construction of the very large flying boat hulls which future developments may evolve, steel may be a possible material, but it will have to be proved that it possesses distinct advantages over its rival, because the lighter metal will always have the advantage of its extra thickness, which

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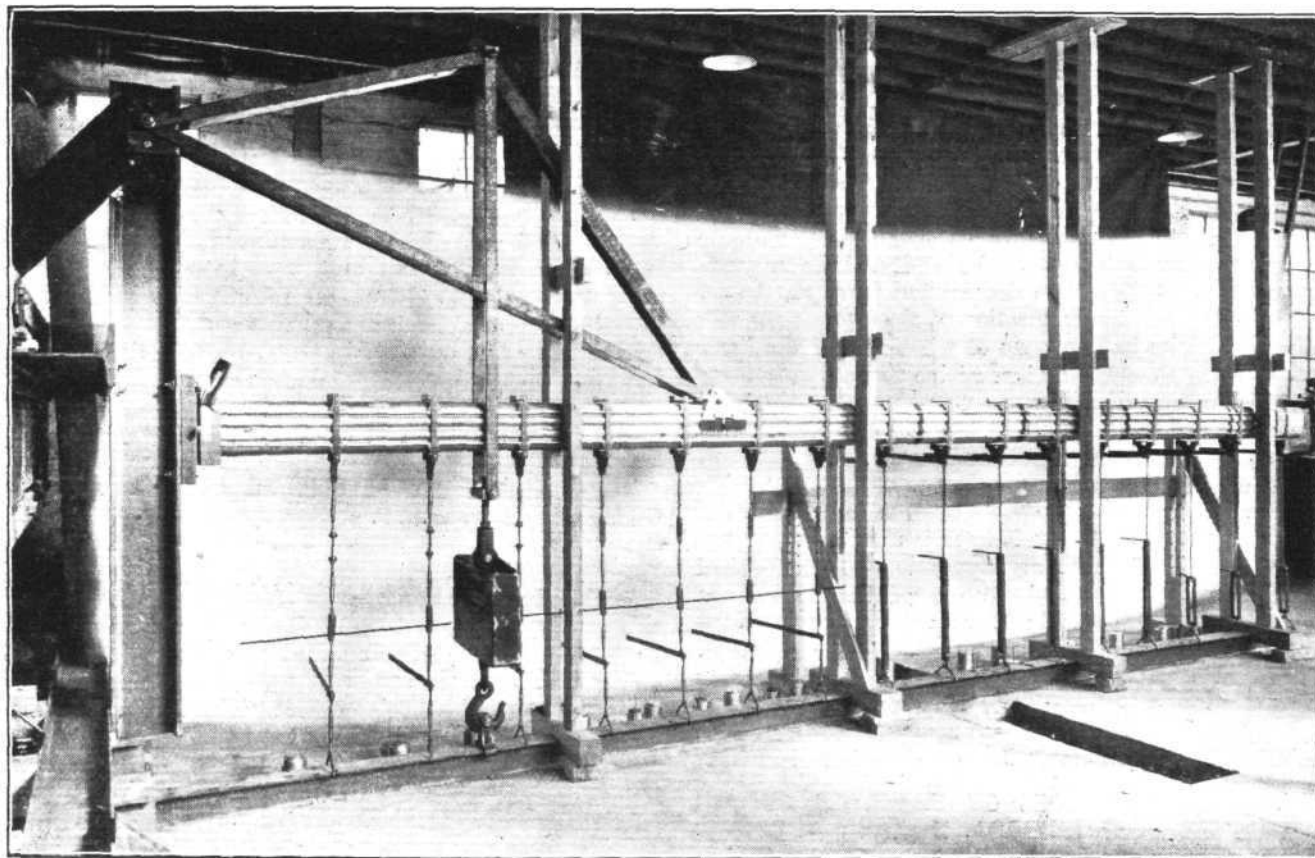
form, and if it can be developed to an entirely successful conclusion, the advantage of rigid and non-water-absorbing plane surfaces should lead to improved performance and the longer life of the planes. Light alloys open up, therefore, an interesting field of development, which is barred to metals of much greater specific gravity.

**Corrosion.**

Nothing has done more to retard the development of light-alloy aircraft construction in this country than the one word "corrosion." We have become familiar with the word rust from childhood, and equally we have come to take it for granted that its effects are not so serious as to deny to us the use of the metals subjected to it. The word "corrosion" has a more fearsome sound, yet the two words have the same meaning and may be applied alternatively. Some metals corrode more rapidly than others, but in any case, certain definite conditions are required to bring about this

manufacturers who use metal for construction purposes. The writer's experience of Duralumin in connection with the machines built by Short Brothers, and the numerous experiments carried out at our Rochester works, extending over nine years, on samples of steel and Duralumin, is as follows:—

Duralumin, without protective covering of any kind, exposed for long periods to ordinary atmospheric conditions, compares very favourably, so far as corrosive effects are concerned, with the ordinary high-tensile steels used in aircraft manufacture; the latter, indeed, appear to suffer far more severely than the former under such conditions. A long series of tests also seem to indicate that with similar unprotected plates immersed in sea water the light alloy is less affected than is the steel of the non-rustless variety. When Duralumin is protected with a suitable paint and exposed to atmospheric conditions, it appears to suffer no deterioration whatever even after several years' exposure, and one is led to the conclusion that



A Short Duralumin spar on test. Built up from corrugated strips, this wing spar showed excellent strength qualities. Under a load 4.8 times normal, maximum stresses of about 40,000 lbs. per square inch were realised. The weight of the spar was 4.25 lbs. per foot run.

phenomenon. The prevention of corrosion consists in avoiding these conditions as far as is possible. The composition of the metal itself is important. The composition and treatment of Duralumin has made it less prone to corrosion than the metal aluminium which forms, perhaps, 93 per cent. of its composition. Rustless steel is a further example of this fact, and indicates one line of research to which metallurgists are, of course, quite alive, and in which we may expect progress to be made. Corrosion may be said to be due to electrolytic action, and the presence of an electrolyte in contact with the metal is a condition of the process of corrosion, where the cause is external. If the electrolyte can be insulated from the metal, corrosion is prevented. The writer does not profess to have a knowledge of the intricate processes connected with the problem of electrolyte action, a phenomenon which is indeed a long way from being completely understood even by those whose work involves a special study of the subject. Nevertheless, the above remarks show the nature of the problem as it affects the aircraft

under these conditions Duralumin may be expected to outlast wood and ordinary high-tensile steels, as used in aircraft manufacture.

When a Duralumin hull or floats are protected in a similar manner, the coating appears to be effective in preventing serious corrosion, so far as tests of 12 and 15 months go to prove. In parts immersed in sea water, care must be taken to keep the protective covering intact by repainting any abrasions, the part having first been carefully washed with fresh water, to remove any traces of salt on the metal. Care must be taken also in the treatment of the metal in the process of manufacture; where a salt bath is used for annealing and normalising purposes the metal must be thoroughly cleansed, and running warm water has been found to be most effective for this purpose. The use of a suitable electric furnace for heat treatment will, of course, dispense with any necessity for this washing process. Such furnaces are being used in France, where the manufacture of Duralumin spars and fuselages is being carried out on a production basis.

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## TECHNICAL LITERATURE.

## A.R.C. REPORTS.

## THE DESIGN OF PITOT-STATIC TUBES.

By E. OWER, B.Sc., A.C.G.I., and F. C. JOHANSEN, B.Sc.  
R. & M. No. 981 (Ae. 194). (12 pages and 11 diagrams.)  
August, 1925. Price 9d. net.

Methods of air measurement are important for a large number of industries, and, in fact, in any factory or other place in which fans are used to create a draught of air for ventilation. There are many methods of measuring this flow of air, but the instrument known as the pitot-static tube gives more accurately than any other method the correct velocity of air flow.

There is little detailed information available on the characteristics of these so-called pitot-static tubes, which consist of an open-ended tube facing the wind with holes situated in a concentric tube aft of the open end. Both openings are normally connected to the ends of a water gauge, and the pressure difference gives a reading proportional to the square of the velocity of air flow.

Experience with the N.P.L. standard instrument has shown that, although it is very accurate when used under appropriate conditions, it suffers from certain defects. In order to design an instrument in which these undesirable features were eliminated, a research was conducted in a wind tunnel, when the following general conclusions were reached:—

The static holes in the concentric tube should be at least six diameters back from the base of the head, and the supporting stem at least 15 diameters down wind from the holes. In these circumstances the calibration of the instrument will be within wide limits independent of the shape of the head used, and will consequently be insensitive to relatively large variations in the form of the nose. Considerable latitude in the manufacture of duplicates will therefore be permissible without entailing the necessity for these to be calibrated. Further, an error not exceeding 0.25 per cent. on velocity will be incurred (in place of 0.7 per cent. with the existing standard) if an instrument of this type is used in which the stem is absent. From both aerodynamic and mechanical considerations a hemispherical nose appeared to be the most suitable, and this was incorporated on the modified form of instrument developed as a result of the research. The tests on this instrument gave satisfactory results; its calibration was found to be 0.3 per cent. on velocity higher than that of the standard, and it was markedly less sensitive than the latter to angular deviations of the wind direction.

**CLOSED-VESSEL EXPLOSIONS OF MIXTURES OF AIR AND LIQUID FUEL (PETROL, HEXANE AND BENZENE) OVER A WIDE RANGE OF MIXTURE STRENGTH, INITIAL TEMPERATURE AND INITIAL PRESSURE.**

By R. W. FENNING.

R. & M. No. 979 (E.15). (29 pages and 16 diagrams.)  
September, 1925. 2s. 6d. net.

One of the outstanding difficulties in the development of the internal-combustion engine is the occurrence of "knock" at high compression ratios. The present report deals with an exploration of the phenomenon with various fuel-air mixtures and is a continuation of the previous work of this kind on air-hydrogen explosions in closed vessels (see R. & M. 902). In these closed vessel experiments the initial temperature and initial pressure of the charge were varied independently and the air-hydrogen mixture of the previous experiments was replaced by air-petrol, air-hexane, and air-benzene.

The effect of varying the air-fuel ratio over a large range (19:1 to 9:1), of varying the initial temperature from 100° to 230° C. (or 300° C. in the case of benzene), and of making additions of exhaust gas and water vapour to some of the air-fuel mixtures, was determined.

At 100° C. initial temperature rich mixtures of all three fuels give rise to a "knock," the intensity of which increases with decrease in the air-fuel ratio. For normal air-petrol and air-hexane mixtures the maximum pressure rise given by charges

of the same density is unaffected by a large change in initial temperature from 100° to 200° C., but the explosion time is shortened.

With normal mixtures of all three fuels the explosion time diminishes with increase in initial temperature and increases with increase in charge density. Raising the initial temperature of normal air-petrol and air-hexane mixtures leads to "knock" of increasing intensity, the "knock" first appearing at the upper charge density and extending to the lower densities as the initial temperature is further increased.

The reduction of maximum pressure due to the addition of a small quantity of "exhaust gas" is slightly less than the percentage of "exhaust gas" in the charge, whereas the explosion time is much increased. Water vapour additions to a normal air-hexane mixture have a similar effect, although in this case the percentage reduction in maximum pressure tends to become slightly greater than the percentage of added water vapour in the charge.

The addition of about 6 per cent. of "exhaust gas" to a normal air-hexane mixture has but little effect in suppressing "knock" at 230° C. initial temperature.

**A COMPARISON OF MODEL AND FULL-SCALE PERFORMANCE OF THE BRISTOL FIGHTER, USING FLIGHT-LIEUT. CAPON'S METHOD OF PRESENTATION.** R. & M. No. 983 (Ae. 195). September, 1925. 4d. net. By E. F. Relf, A.R.C.S.C.

Another report, R. & M. 985, by Flight-Lieut. Capon describes a new method of reduction of aircraft performance tests. This method has been used in the present note to compare the results of tests on a 1/5th scale Bristol Fighter model with airscrew running, and of the full-scale performance trials carried out by Captain G. T. R. Hill at three heights and with full throttle. It would appear that the performance as predicted from the model experiments and that measured in flight are in agreement for the Bristol Fighter within the accuracy of measurement.

These Reports can be obtained from H.M. Stationery Office, Kingsway, W.C. 2.

**The Rigid Airship.**

With the resumption of rigid airship construction work in this country, the problems of airship structural design have once more become pressing, and any work which may help to throw light on the subject should be welcomed. When, as in the case of the book entitled "The Rigid Airship" by E. H. Lewitt, B.Sc., M.I.Ae.E., A.M.I.Mech.E., Lecturer in Engineering at the City and Guilds (Engineering) College of the Imperial College of Science and Technology, S. Kensington, published by Sir Isaac Pitman & Sons, Ltd., Price 30s. net, the work is of a really comprehensive nature, it is all the more valuable, and the book which Mr. Lewitt has given us should help very materially those who desire to take up the subject of rigid airship design, even if it does not, perhaps, present any information that is really new. The data collected together form an excellent textbook on the very complicated subject of airship hull design, and even those who have had some experience of this class of work will find in this book much to interest and assist them.

As the author points out in his preface, the rigid airship presents a type of structure which has not previously occurred in engineering, and consequently many fresh problems in engineering design have appeared. The book is written, the author states, on the results of experience gained while engaged on the design of rigid airships at the Bedford works of Short Brothers and at the Air Ministry. It is intended for the use of designers and aeronautical students, and it is assumed that the reader has a knowledge of engineering principles "up to the standard of a university degree." It deals with the structural design and performance only, and no attempt has been made to deal with engines and machinery. The analytical solutions, experimental results, suggested approximations, and performance equations given are due to Mr. Lewitt, who has already published some of them elsewhere. The method of treatment throughout has been to approach each problem mathematically and to compare the results so obtained with actual experience.

# WORLD'S RECORDS IN AVIATION

IN FLIGHT for January 29, 1925, we published a complete list of the World's aviation records as standing on December 31, 1924. Since then several of these records have been beaten and in many cases have, as far as the nationality of the holders is concerned, changed hands. It will hardly be necessary for us to repeat here those records that stand the same now as for 1924, but we publish below a list of the new records, as standing on December 31, 1925. Thus any particular class not given below may be taken to be still unbroken and as published in our previous list.

## Class C (Power-Driven Aeroplanes)

### (b) Records without Refuelling.

*Distance, Non-Stop.*—4,400 kms. (2,728 miles); France, Drouhin and Landry, on Farman, 450 h.p. Farman, at Etampes-Chartres, August 7-9, 1925.

*Duration, Non-Stop.*—45 hrs. 11 mins. 59 secs.; France, as above.

*Distance, Non-Stop, Cross-Country.*—3,166 kms. (1,963 miles) France, Capts. Arrachard and Lemaître, on Breguet 19 B-2, 480 h.p. Renault, Etampes-Villa Cisneros, February 3-4, 1925.

*Speed (Ground Level).*—100 kms. (62.14 miles):—401.279 k.p.h. (248.8 m.p.h.); U.S.A., Lieut. C. Bettis, on Curtiss R-3C-1, 600 h.p. Curtiss, at Mitchel Field, October 12, 1925.

200 kms. (124.2 miles):—400.687 k.p.h. (248.41 m.p.h.); as above.

1,000 kms. (621.4 miles):—248.296 k.p.h. (153.9 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Villesauvage, August 29, 1925.

1,500 kms. (932.1 miles):—218.827 k.p.h. (135.67 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1 500 h.p. Hispano-Suiza, at Villesauvage, September 12, 1925.

2,000 kms. (1,242.8 miles):—218.759 k.p.h. (135.63 m.p.h.); as above.

### Records with 250 kgs. (551.2 lbs.) useful load.

*Speed.*—100 kms. (62.14 miles):—281.030 k.p.h. (174.2 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Etampes, October 7, 1925.

200 kms. (124.2 miles):—279.720 k.p.h. (173.4 m.p.h.); as above.

500 kms. (310.7 miles):—249.618 k.p.h. (154.7 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Etampes, September 1, 1925.

### Records with 500 kgs. (1,102 lbs.) useful load.

*Speed.*—100 kms. (62.14 miles):—281.030 k.p.h. (174.2 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Etampes, October 7, 1925.

200 kms. (124.2 miles):—279.720 k.p.h. (173.4 m.p.h.); as above.

500 kms. (310.7 miles):—249.618 k.p.h. (154.7 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Etampes, September 1, 1925.

### Records with 1,000 kgs. (2,205 lbs.) useful load

*Duration.*—3 hrs. 3 mins. 30 $\frac{1}{2}$  secs.:—Holland, B. Grasé, on Fokker F.7, 400 h.p. "Liberty," at Schiphol, July 27, 1925.

*Distance.*—200 kms. (124.2 miles); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Etampes, October 16, 1925.

*Speed.*—100 kms. (62.14 miles):—246.440 k.p.h. (152.7 m.p.h.); France, Fernand Lasne, on Nieuport-Delage 42 C.1, 500 h.p. Hispano-Suiza, at Etampes, October 16, 1925.

200 kms. (124.2 miles):—244.864 k.p.h. (151.8 m.p.h.); as above.

### Records with 1,500 kgs. (3,307.5 lbs.) useful load

*Duration.*—3 hrs. 3 mins. 30 $\frac{1}{2}$  secs.:—Holland, B. Grasé, on Fokker F.7, 400 h.p. "Liberty," at Schiphol, July 27, 1925.

*Altitude.*—5,516 m. (18,092.4 ft.); Italy, G. B. Bottala, on F.I.A.T. BR-1, 700 h.p. Fiat A-14, at Turin, December 23, 1924.

### Records with 2,000 kgs. (4,410 lbs.) useful load

*Duration.*—2 hrs. 19 mins. 16 $\frac{2}{3}$  secs.; France, L. Bossoutrot, on super-Farman Goliath, (4) 500 h.p. Farman, at Le Bourget, November 12, 1925.

*Altitude.*—4,990 m. (16,367.2 ft.); as above.

### Records with 3,000 kgs. (6,615 lbs.): useful load.

*Duration.*—2 hrs. 19 mins. 16 $\frac{2}{3}$  secs.; as above.

*Altitude.*—4,990 m. (16,367.2 ft.); as above.

*Records with 4,000 kgs. (8,820 lbs.) useful load*

*Duration.*—2 hrs. 19 mins. 16 $\frac{2}{3}$  secs.; as above.

*Altitude.*—4,990 m. (16,367.2 ft.); as above.

*Records with 5,000 kgs. (11,025 lbs.) useful load*

*Duration.*—1 hr. 12 mins. 21 secs.; France, L. Bossoutrot, on super-Farman Goliath, (4) 500 h.p. Farman, at Le Bourget, November 16, 1925.

*Altitude.*—3,586 m. (11,762 ft.); as above.

*Records with 6,000 kgs. (13,230 lbs.) useful load*

*Duration.*—1 hr. 12 mins. 21 secs.; as above.

*Altitude.*—3,586 m. (11,762 ft.); as above.

## Class Cbis (Seaplanes)

### (b) Records without re-fuelling

*Duration.*—28 hrs. 36 mins. 27 secs.; U.S.A., Lieuts. Shildauer and J. R. Kyle, on P.N.9 flying boat, (2) 500 h.p. Packard, at Philadelphia, May 1-2, 1925.

*Speed.*—(Ground level):—395.439 k.p.h. (245.1 m.p.h.); U.S.A., Lieut. J. H. Doolittle, on Curtiss seaplane, 600 h.p. Curtiss, at Baltimore, October 27, 1925.

100 kms. (62.14 miles):—377.829 k.p.h. (234.2 m.p.h.); as above.

200 kms. (124.2 miles):—377.158 k.p.h. (233.8 m.p.h.); as above.

### Records with 250 kgs. (551.2 lbs.) useful load

*Altitude.*—5,831 m. (19,125.6 ft.); Italy, Lieut. Adriano Bacula, on Savoia S58, 300 h.p. Hispano-Suiza, at Sesto Calende, August 25, 1924.

*Speed.*—100 kms. (62.14 miles):—168.523 k.p.h. (104.4 m.p.h.); Italy, Guido Guidi, on Dornier-Wal 33, "Idaor," (2) 260 h.p. Rolls-Royce, at Pisa, February 4, 1925.

200 kms. (124.2 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

500 kms. (310.7 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

### Records with 500 kgs. (1,102 lbs.) useful load

*Speed.*—100 kms. (62.14 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

200 kms. (124.2 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

500 kms. (310.7 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

### Records with 1,000 kgs. (2,205 lbs.) useful load

*Distance.*—507.380 kms. (2,512.8 miles); as above.

*Altitude.*—4,053 m. (13,293.8 ft.); France, Paumier, on F.B.A.-Louis Schreck, 500 h.p. Hispano-Suiza, at Argenteuil, December 5, 1925.

*Speed.*—100 kms. (62.14 miles):—168.523 k.p.h. (104.4 m.p.h.); Italy, Guido Guidi, on Dornier-Wal 33, "Idaor," (2) 260 h.p. Rolls-Royce, at Pisa, February 4, 1925.

200 kms. (124.2 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

500 kms. (310.7 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

### Records with 1,500 kgs. (3,307.5 lbs.) useful load

*Duration.*—3 hrs. 33 mins. 35 secs.; as above (February 10, 1925).

*Distance.*—507.380 kms. (2,512.8 miles); as above (February 10, 1925).

*Altitude.*—3,682 m. (12,076.9 ft.); as above (February 4, 1925).

*Speed.*—100 kms. (62.14 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

200 kms. (124.2 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

500 kms. (310.7 miles):—168.523 k.p.h. (104.4 m.p.h.); as above.

### Records with 2,000 kgs. (4,410 lbs.) useful load

*Distance.*—253.690 kms. (157.6 miles); as above (February 9, 1925).

*Altitude.*—3,006 m. (9,909.6 ft.); as above (February 4, 1925).

*Speed.*—100 kms. (62.14 miles):—133.781 k.p.h. (82.9 m.p.h.); as above (February 9, 1925).

200 kms. (124.2 miles):—134.514 k.p.h. (83.4 m.p.h.); as above (February 9, 1925).

## Class D (Glanders)

*Duration.*—10 hrs. 19 mins. 43 $\frac{2}{3}$  secs.; France, Comm. Massaux, on Poncelet Vivette, at Vauville, July 26, 1925.

## NOTICES TO AIRMEN

### The Air Navigation (Amendment) Order, 1925

It is notified:—

1. Attention is drawn to the fact that the Air Navigation (Amendment) Order, 1925 (S.R. & O., 1925, No. 1260, dated December 16), entered into force on January 1, 1926. The Order is obtainable, price 3d. net, from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, or through any bookseller.

2. This new order amends a considerable number of the provisions of the Air Navigation (Consolidation) Order, 1923. The principal amendments are summarised as follows:—

(i) A provision of the principal Order under which the requirements as to registration, certification as airworthy, and the carriage of certain documents do not apply to aircraft flown for the purpose of experiment or test only within three miles of a licensed or Air Ministry aerodrome, or of an aircraft factory, is modified so as to extend this exemption to aircraft flown in accordance with directions or special permission in writing given by the Secretary of State.

(ii) A fixed balloon shall not be flown except with the special permission in writing of the Secretary of State.

(iii) No person while intoxicated may enter or be in any aircraft.

(iv) The existing provision as to dropping of articles from aircraft is revised so that proceedings may be taken even where the actual person who dropped the article is unknown.



### Civil Aviation in Ireland

THE Committee of the Irish Aero Club held their first weekly meeting in the Hibernian Hotel, Dublin, on January 18, Sir James Percy presiding.

The Chairman said there was not a shadow of doubt that aviation was coming into its own, and the sooner they in Ireland put forward something definite the better for all concerned, and he believed that a lot of people would join and support them. The aeroplane was more advanced today than the motor car, in its sphere, was 20 years ago. So congested had the roads now become that many people were anxious to get away from the dust and traffic.

Senator Oliver Gogarty suggested appointing a deputation to approach the Government on the matter. There was a hangar at their disposal at Baldonnell Aerodrome. A proposal had been made that repairing be done at cost price by the civilian mechanics in the Irish Army in the hangar repair shops.

They needed to draw up certificates of airworthiness, continued Senator Gogarty, but it was necessary to learn how far that would be tolerated by the Government.

The question of Government grants to support aviation clubs in obtaining machines is also to be taken up with the Government at an early date.

It was decided that an interview be arranged with the Government, and the Committee formed a deputation to put forward the case for the establishment of clubs. There is every reason to anticipate a favourable reception for the proposals of the Aero Club, but the Irish Treasury will need to be assured that there is every prospect of success before disbursing financial assistance in any shape or form. For the Committee it must be said that it is very optimistic, and believes that marked progress will be seen in a short while, ever realising, of course, that the flying spirit must be cultivated.

### New Transatlantic Flight—Plans for Irish Air Force Attempt

PLANS for a transatlantic attempt are now rapidly taking shape in the Irish Air Force. A three-engined British aeroplane, carrying two pilots and a navigator belonging to the Irish Free State Air Force, is to ascend from Clifden, Co. Galway, in July next in an attempt to fly non-stop to Newfoundland.

The technical advisers of the Saorstát Government, in collaboration with well-known British aviators, have chosen July for the attempt, because in that month the head-winds that oppose any flight westward across the Atlantic are least powerful.

Negotiations are proceeding with several British aircraft firms for a suitable machine, which it is stated should be driven by three air-cooled engines. The cruising speed of the plane, it is calculated, will be from 85 to 90 miles an hour, and allowing for a moderate head-wind, the machine should alight at St. John's, Newfoundland, about 24 hours after departure.

The distance to be negotiated is 1,900 miles. The start will be made from Clifden, on the Galway coast, village

(v) The Secretary of State is empowered to issue directions as to carriage of W/T apparatus and operators, and the W/T service to be maintained.

(vi) The provisions of Schedule II of the principal Order regarding the examination before flight of aircraft carrying passengers for hire or reward are revised.

(vii) The zone in which the aerodrome circuit rules apply is extended to 3,500 yards from the perimeter of the aerodrome.

(viii) The zone in which aerial acrobatics are prohibited at public aerodromes is increased from 2,000 to 4,000 yards from the perimeter of the aerodrome. Aerial acrobatics in this zone are not, however, prohibited above 6,000 ft.

(ix) The rules for renewals of pilots' licences are revised.

(x) Certain amendments have been made in the prohibited areas (Schedule VII of the principal Order).

3. In connection with the amendment of the requirements regarding examination of aircraft before flight (Schedule II, paras. 8-10, of the principal Order), opportunity is now taken to point out, as there appears to be misconception in this matter, that the provisions of paragraph 8 of Schedule II as to inspection and certification of flying machines by a ground engineer before flight relate only to aircraft carrying passengers or goods for hire or reward, and not to private aircraft.

(No. 1 of 1926.)



famous in aeronautical history as the spot where Alcock and Brown, the British aviators, landed in 1919, having flown eastward from Newfoundland in 16 hours.

It is believed that Colonel C. F. Russell, who is in command of the Air Force since Major-General Sweeney's resignation last year, will be chief pilot. Colonel Russell's headquarters are established at Baldonnell, outside Dublin. He is an experienced aviator, and "graduated" at the Farnborough Aerodrome, and fought with the British Forces during the War.

Precise and definite particulars will be forthcoming concerning the actual plans in hand at an early date, and the proposed flight may be taken as an indication of the early development of the Air Force in the Free State. The acquisition of a large number of newer and more up-to-date machines is occupying the attention of the authorities at the moment.

### Air Mail Notices

THE Postmaster-General announces that the despatch of separate letter and parcel Air Mails from London to the British Army of the Rhine ceased on January 16, as the Air Mail, in consequence of the evacuation of the Cologne Area, now offers no advantage to the Army over the ordinary postal services. The despatch of civil letter and parcel Air Mails to Cologne (available for letters for any part of Western or Southern Germany, and for parcels for any part of Germany) is being maintained. The special Air Mail fee payable on a letter for any address in any part of Germany (including Cologne and the occupied area) is now 3d. per oz.

There appears to be an impression in some quarters that the Toulouse-Casablanca Air Mail Service has been suspended. This is incorrect. The despatch closed at the G.P.O., London, at 6 p.m. Route 9 in the current Air Mail Leaflet dated December, 1925, is being maintained.

### Xmas Greeting from Ambala

R.A.F. STATIONS at home may have wondered why, this Xmas, the usual greetings from the Sergeants' Mess at Ambala India failed to materialise. The President of the Mess has asked FLIGHT to explain the position, which was that a drawing had been prepared for the Xmas card, and the printers said it could be reproduced. When the cards arrived they were disappointing, to say the least, and were not such as the Mess would care to send out. By this time it was too late to do anything, as regards stations at home, although another card was hurriedly got out, which "did the trick" as far as India was concerned. For the benefit of home Stations we give the text of card No. 2, in which the situation was explained as follows:

A design was drawn for our Xmas Cards,  
And sent for "reproduction,"  
But alas! the printers made a mistake,  
And thought we meant "reconstruction."  
And so this card we send to you,  
Is plain, or very nearly,  
But without colours or crest, the wishes it conveys,  
Are tendered—very sincerely.

# THE SCHNEIDER CUP RACE, 1925

MAJOR J. S. BUCHANAN, before reading his paper on "The Schneider Cup Race" before the Royal Aeronautical Society on January 21, 1926, pointed out that he was indebted to the Air Ministry for permission to give the paper, but at the same time he was directed to say that the views expressed therein did not in any way represent the official view of the Air Ministry, nor indicate the policy which was to be followed.

The first part of Major Buchanan's paper was devoted to a history of the Schneider Cup race, from the first one in 1913 at Monaco, to last year's race at Baltimore. As the history of the Schneider Cup race has been fairly fully dealt with in *FLIGHT*, there should be no necessity to repeat it here, and it will suffice if we mention that the speeds in the race have risen from 45.4 m.p.h. in 1913 to 234 m.p.h. in 1925.

The lecturer stated that the Schneider Cup race could be viewed from two aspects: the first was the sporting and spectacular point of view, and the second the technical and scientific. He suggested that it was essential for progress in aviation to maintain these contests, but whether it was right that such races should be confined to such expensive instruments as the Schneider Cup type of machine, and at a cost which could only be borne by Governments, was a question that deserved very careful consideration. Failing Government support, the cost of this kind of racing was such that, under present conditions, no private owner could support it for any length of time. Major Buchanan pointed out that the original deed of gift of the cup provided for inter-club racing, and he doubted whether it was ever contemplated that the contest would in time become a competition between Governments. Major Buchanan suggested that *aircraft racing authorities might follow the lead given by yachtsmen, and introduce international races for small aeroplanes, in the same manner and under somewhat similar conditions to those prevailing for the international races for the 6-metre class yachts.* (The italics are ours.—Ed.)

The next part of Major Buchanan's paper dealt with the British Schneider Cup challengers, the Gloster II and Gloster III, and the Supermarine S.4, and gave a brief outline of the relatively small amount of testing which it was possible to carry out before the machines had to leave for America.

In the portion of Major Buchanan's paper dealing with the flying at Baltimore, the navigability and watertightness tests, etc., the statement was made that the Supermarine S.4 stalled and crashed into the sea. This, we believe, is the first time that a definite cause has been assigned to Capt. Biard's crash.

The actual account of the 1925 Schneider Cup race itself in the main contained little that has not already been published in *FLIGHT*, and it is not therefore proposed, in view of the limited space at our disposal, to deal at length with this part of the paper. Tables were given showing the speeds attained by the various competitors in each of the seven laps of the course, and it will suffice if we quote from this table the highest speeds attained by the various competitors. The fastest lap covered by the winner of the race, Lieut. Doolittle, was the last one, during which the average speed of the Curtiss racer was 235.036 m.p.h. Capt. Broad's fastest lap was the third, in which his average speed was 201.536 m.p.h. Briganti's fastest lap was the third, covered at an average speed of 173.858 m.p.h. The two remaining

competitors did not complete the course, but Lieut. Cuddihy's fastest lap was the fourth, in which his speed was 223.081 m.p.h. and Lieut. Offstie's fastest lap was the fourth, in which his speed was 223.041 m.p.h.

Turning to the more technical aspects of the race, Major Buchanan gave a table, which we reproduce herewith, in which he gave such information as he had been able to collect on the more important racing aircraft of recent years. He pointed out, however, that the information had been gathered from a large number of sources, and it had not always been possible to check all the details with absolute accuracy. He thought, however, they were sufficiently accurate to serve as a basis of comparison.

The lecturer called attention to the "Bamel" seaplane, which existed as an aeroplane in 1923, and he pointed out that if a pair of floats had been fitted to it, as has now been done, its speed would have been within 5 m.p.h. of the Curtiss winner. It was, therefore, fair to say that, except for wing radiators and Reed propellers, in 1923 we were as far advanced in racing types as America, and it was from 1923 onwards that we failed to keep abreast of our competitors.

Turning next to an examination of the respects in which the Curtiss racers in the last Schneider Cup race were superior to the British entries, Major Buchanan stated that the principal points of superiority were: (a) general cleanness of design and absence of parasitic resistance (except possibly in the case of S.4); (b) wing radiators; (c) more efficient propellers of the latest Reed type; (d) better trained pilots, and a settled organisation for racing.

The only point on which British designers could fairly claim superiority was in float design. Both the Gloster III and the S.4 were cleaner on the water, and had a much cleaner and a much quicker take-off than either the Curtiss or Macchi racers.

On examining these items in detail it was, the lecturer said, apparent that under (a) the most important item was body drag. If a good high-speed wing was chosen, improvements in wing form could only give increases of speed of a minor order. In connection with body drag, the lecturer referred to an analysis made by Mr. Glauert and Mr. McKinnon Wood, of the Curtiss aeroplane racers of 1923, in which it appeared that the body drag of this aeroplane should be from 2½ to 3 lbs./sq. ft. of frontal area at 100 ft. per second. If this drag could be reduced to 1½ lbs./sq. ft., it was estimated that a gain of 8 per cent. in speed would result. The resistance of a good streamline shape at 100 ft. per second was 1.2 to 1.3 lbs./sq. ft.; but it was unlikely that this figure could be achieved on an aeroplane, because of the cockpit opening and minor obstructions. Model tests at the N.P.L. indicated that the cockpit opening with wind-screen and pilot's head would increase this resistance to 1.7 lbs./sq. ft. It was possible, therefore, the lecturer said, that as much was to be gained by a carefully faired and streamlined body as by an actual reduction in the cross-sectional area. Obviously it would be better to reduce the drag by both methods, but the reduction in cross-sectional area of the body was limited by the size of the pilot and the space necessary for instruments, etc.

Under heading (b) Major Buchanan stated that the Curtiss Company claimed that the introduction of wing radiators improved the speed of their aeroplanes by 20 m.p.h. at speeds

TABLE  
Characteristics of Racing Seaplanes

	Sea Lion.	Bamel.	Gloster II.	Gloster III	S. 4.	Curtiss 1923.	Curtiss 1924.	Curtiss 1925.
Total Weight (lbs.)	3,230	2,770	2,500	2,687	3,191	2,747	2,640	2,710
Wing Area (sq. ft.)	285	200	150	152	136 (flaps.)	148	162	144
Wing Loading (lbs./sq. ft.)	11.3	13.8	16.6	17.7	23.5	18.5	16.3	18.8
H.P. Loading (lbs./h.p.)	5.6	4.8	3.95	3.8	4.6	6.0	5.3	4.4
Area of Fuselage—								
Max. Cross Section (sq. ft.)	11.5	—	9.1	9.1	8.1	7	7	6.5*
Prop. Diar.	8ft. 8ins.	9ft. 6ins.	9ft. 10ins.	7ft. 9ins.	8ft. 0ins.	8ft. 6ins.	—	7ft. 8ins.
Prop. Pitch	10ft. 6ins.	12ft. 10ins.	15ft. 11ins.	8ft. 11ins.	9ft. 3ins.	9ft. 4ins.	—	10ft. 0ins.
Engine Weight (lbs.)	920	920	840	730	730	690	690	660
Engine horse-power	575	575	633	700	700	460	500	619
Engine r.p.m.	2,300	2,300	2,500	2,700	2,700	2,300	2,300	2,350
Speed on Straight (m.p.h.)	155	189	210	218	237	194	227	246
Landing Speed (m.p.h.)	63.5	75	(estimated) 79	80	90	85	80	85

\* Wing radiators, 174 sq. ft.

in the neighbourhood of 250 m.p.h. It, therefore, seemed essential that future racing aeroplanes should be fitted with surface radiators.

Under heading (c) Major Buchanan said that the limited time available did not permit of carrying out propeller tests on the British machines before they went to America. The forged type of Reed propeller, as used by the Americans, was reported to give better results than the best sheet type, and it was claimed that an improvement of 3 per cent. in efficiency was obtained. The interesting statement was made by Major Buchanan that the propeller efficiency of the seaplanes of 1925 was about 80 to 85 per cent. at full speed, and probably as low as 8 per cent. at take-off speed.

Turning to (d), the question of training of pilots, the lecturer stated that the American pilots were experienced in racing, and all of them were fully trained, whereas, apart from a few flights before leaving this country, none of our pilots had any experience of flying or cornering at 200 m.p.h.

Finally, Major Buchanan expressed the opinion that little was to be gained by reduced engine weight or reduced structure weight. The engines were approaching 1 lb. per h.p., and even if it were possible to reduce this to  $\frac{1}{2}$  lb. per h.p., the gain in speed would not be more than, say, 2 per cent.

In conclusion Major Buchanan summed up the problems we have to solve in order to increase our speed in the next race as follows: (1) the body drag must be reduced, both by reducing size and increasing efficiency; (2) wing surface radiators must be used; (3) the best type of propeller must be fitted, and to ensure success in this direction the aircraft must be carefully tested-out before entering for the race; (4) highly-trained pilots must be available to fly the aeroplanes.

### The Discussion

Sir Sefton Brancker, who was in the chair, then called upon Mr. H. P. Folland to open the discussion. Mr. Folland pointed out that he was naturally very much interested in the paper, since he had been connected in some small way with the Schneider Cup Race of 1925. He pointed out that whereas the Americans had had a great deal of experience in air racing of various sorts, we in this country had had very little experience of air racing at really high speeds. Concerning the "Bamel," to which the lecturer had referred, this machine, he said, was not really ever designed as a racer, but was the rear portion of the fuselage of the "Night-hawk," into the front portion of which a Napier "Lion" had been fitted, and the design as a whole had never been contemplated in its entirety. If we were to have any chance of equalling the speeds of the Americans it would be necessary for pilots to be taken over six months before the race for training purposes, and that being so it might be found that it was preferable to employ service pilots for this kind of racing. The question of engine was an all-important one, and it seemed a pity if something could not be done to give British aircraft designers an engine of smaller drag. On the subject of propellers, he thought we ought to carry out experiments on metal propellers, since their experience was that in the Schneider Cup machines the propellers used had a tendency to straighten out owing to movements of the centre of pressure. He agreed with the lecturer on the question of higher load factors being required, and thought that these should be somewhere about 8 or 9. As our pilots got used to the fast machines they would be able to "throw them about" more, which might mean that loads up to, say, 5g. would be imposed upon the machines.

Mr. R. J. Mitchell said he was interested in the lecturer's suggestions for improvements. He agreed with the lecturer that body drag was an important item, but thought it probable that interference between body and wing, or body and undercarriage, might be equally important, and that bad attachments of these members to the fuselage might easily double the resistance. Concerning the lecturer's statement that a reduction in engine weight of from 1 lb. per h.p. to  $\frac{1}{2}$  lb. per h.p. would only give an increase of about 2 per cent. in speed, he thought this was a dangerous remark, since there were engine people present. His own estimate would be rather higher, say, about 2 $\frac{1}{2}$  per cent. The fact was that a reduction in weight led to other reductions. As the lecturer had pointed out, the maximum cross-sectional area of the Supermarine S.4 was 8 sq. ft. This could have been reduced but for the cantilever wings and undercarriage. The lecturer had pointed out the roads to improvement, and if the experience gained in the last Schneider Cup Race was taken advantage of, he viewed the future with optimism. Moreover, he still thought the Napier racing engine capable of winning the Cup.

Capt. Biard said he agreed with the lecturer in the matter of training of pilots. The British pilots had only had 1 $\frac{1}{2}$  hours at full speed on the machine previous to the race, and he

thought we should have lost the race on that score only, apart from the relative performances of the machines. He had been interested in the lecturer's statement that high-speed dives were not necessary, and promised to take this to heart—a statement which caused a great deal of amusement.

Squadron-Leader Rollo Haig wanted to know whether the winner used a doped fuel, and, if so, how was it composed? He would also like to know whether the American machines were equipped with parachutes and, if so, whether the pilots could have used them had they been needed.

Commander J. Hunsaker thought these races were very useful for technical men. On the question of engines, the reduction of area was a matter for the engine designers, and he thought the lecturer was not quite right in his remarks about engine weight. The thing to do was not to reduce the engine weight below what it was now, but to keep the engine weight the same and double the power output of it. If this were done there would be a very immediate gain in speed, and this was what the Curtiss Company had done. Concerning last year's race, it was an unfortunate fact that comfort for the spectators meant discomfort for the pilots. At the next Schneider Cup Race the public would, he thought, be given less consideration and the crews more. As regards the future, Commander Hunsaker said that as engine power increased, so speed would go up. Improved load factors would meet this, but he was not so sure about the load factors of the pilots, and it did seem unwise to go on with a race which in time would tend to become a test of pilots rather than of machines. Perhaps it was time a different course was chosen, say, a hexagonal one instead of a triangular one, since this would reduce the angle of turns that had to be made, and so machines could be more on a steady curve the whole way round the course.

Mr. M. L. Bramson said there was a difficulty in establishing a criterion for engines, and suggested as a possible formula, horse-power divided by weight, and divided by frontal area, as a sort of "efficiency figure" for engines. He would like to know whether, in attaching the wings to the fuselage, it was better to attach them at the bottom, in the middle, or at the top, or whether the parasol arrangement was likely to be better, giving an ideal fuselage and an ideal wing. There was also the question of the effect of the spiral slip-stream on the portion of the wing which should be the most useful. Concerning cornering, he would like to know which of three methods would be likely to be the best, either corner sharply but slow down for the turn, keep at top speed but take the corners wide, or maintain full power but climb at the turn so as to convert dynamic into kinetic energy, which could be made use of on the straight on the way to the next corner.

Flight-Lieut. Bulman thought the British pilots did extremely well with their limited experience. He said he had personally had very little experience of racing on really fast machines, but from his experience as a test pilot he thought that when a pilot first took out a new type his first troubles were mainly machine troubles. For the first hour or so the behaviour of the machine occupied his mind to the exclusion of almost everything else. After that, he began to pay attention to the technique of flying the machine. At full speed the question of the directional properties of the machine became very important. He did not think there could be any doubt that to fly the best race it was necessary to cut the corners fine, and to fly as low as possible, and it was then extremely important that the machine should have good directional and lateral controls. One of the most important things which made for success was to make the pilot feel comfortable. He would like to know something about directional control in racers, and he had personally found a difficulty in preventing fast machines from climbing.

Mr. F. Handley Page wanted to know if the lecturer could give the analysis by McKinnon Wood referred to in the paper, as this would be very interesting. He suggested that possibly the analysis could be printed as an addendum to the paper.

Colonel Bristow thought the Royal Aero Club had not produced as much progress by handicap races as by scratch races, and thought it a pity that we could not have more pure speed racing. On the question of pilots, to send the British pilots over for the Schneider Race with the little experience they had had was about equivalent to giving a racing driver an hour or so on Brooklands track and then, with no further training, expect him to take part in the Grand Prix. Colonel Bristow humorously referred to the testing of models of racers in wind-tunnels, and said that perhaps some day it would not be necessary to hold the Schneider Cup Race at all. What would be done would be to have models of the various challengers and defenders tested in the wind-tunnels, and have the results sent to Locarno, where they

would then be judged by all the Prime Ministers of Europe. In conclusion, he said he would like to point out that after all Great Britain very nearly won the Schneider Cup Race, since 66 per cent. of the Curtiss engines broke down, and it seemed quite possible that had the race lasted a bit longer the remaining 33 per cent. would have broken down also, and left Great Britain the winner!

Major Buchanan, in replying to the various queries raised in the discussion, said that the fuel used by the Americans was a mixture consisting of 50 per cent. petrol and 50 per cent. benzole. He agreed with Commander Hunsaker that the best line of development was to keep the present engine-weight the same, but to try to double the power output. Concerning the effect on pilots of cornering, he thought the experience of Lieut. Doolittle in some test flights with an accelerometer was that it was discovered that he could stand 4g. for fairly long periods, and as much as 8 g. for very short periods. On the question of the stability of the racers, he thought Captain Broad was troubled throughout the race by a certain amount of directional instability. Curiously enough, it seemed that the experience of all the Schneider Cup pilots was that the worst effect of acceleration was felt during the take-off. He thought undoubtedly the American machines had better directional stability. He did not think Mr. Bramson's suggestion of letting the machine climb at the

turns and then, after straightening out, diving for the next turning point, would result in a good course being flown. Actually, he thought, Lieut. Doolittle, did climb slightly, but only about 50 feet or so on turns, and he thought this climb was probably accidental rather than intentional.

Sir Sefton Brancker said he was a keen supporter of racing and he referred to the good effect which such air races as the Schneider Cup had internationally. He expressed his gratitude to the three firms who had taken part in last year's Schneider Cup Race and then, turning to the question of organisation, said this was important, and last year's British organization was lacking in funds. It was difficult to find a patron for the expenses incurred in training civilian pilots for races, and that being so, perhaps it would be better to turn to the Services for racing pilots. Concerning Commander Hunsaker's remarks relating to studying the public and giving them a chance to watch the race, he thought that although this might be the correct attitude for ordinary races, it was not so in the case of championships such as the Schneider Cup Race, and it might be necessary to neglect the public in order to give the competitors a fair chance. Although he was not speaking officially, he thought he could say that if the Schneider Cup Race was put off until 1927, the Air Ministry would "see it through" as regards British challengers.

## THE GOVERNOR-GENERAL OF AUSTRALIA TO FLY

As briefly mentioned last week, the recently-appointed Governor-General of Australia, Lord Stonehaven, is a keen and practical supporter of aviation, who realises keenly the part which the aeroplane can play in the development of the Commonwealth. It is not surprising, therefore, to learn that Lord Stonehaven—who, during the War as Major J. L. Baird, C.M.G., D.S.O., M.P., was Under-Secretary of State for Air—intends to use an aeroplane for official visits throughout Australia.

The machine which will be used is now approaching completion at the De Havilland Aircraft Company's Works at Edgware. It is a D.H. 50 biplane, fitted with a 230 h.p. Siddeley "Puma" engine, and is similar to that which Alan Cobham used for the flight from London to Rangoon and back last year and for the journey to Cape Town, upon which he is now engaged.

There is a cabin with seats for four passengers, so that an A.D.C. and a private secretary will be able to accompany the

Governor on his journeys, as they would by any other means of transport.

A feature of the aeroplane (which has been ordered by the Australian Air Board) is its interchangeable undercarriage, it being but the work of an hour or so to convert it from a land-plane with wheels to a seaplane with floats, so that, should a coastal journey be contemplated, the machine would fly as a seaplane, while for overland trips it will be used as an ordinary aeroplane.

A striking demonstration of the value of air transport in Australia was afforded by Col. Brinsmead's recent flight across Australia from north to south, which, as described in last week's *FLIGHT*, was carried out on a D.H.50 aeroplane in two days—a journey of 1,600 miles which, by any other mode of transport, would occupy three or four weeks, and it is expected that by using the aeroplane Lord Stonehaven will be able to visit outlying parts of Australia which hitherto have been out of reach owing to lack of communications.

### A British Schneider Cup Team?

WE understand that, after all, Great Britain will be represented by a full team at the next Schneider Cup contest, for Mr. S. E. Saunders, of Cowes, has sportingly come forward with the offer to enter a team of three or four challengers.

### Paris—Teheran and Back

THREE of the four French military airmen—Capt. Girier, and Lieuts. Challé and Rabatel—who set out from Villacoublay to fly to Teheran and back, returned safely to Lyons on January 18, having covered over 8,000 miles in about 80 hours' flying time. Lieuts. Challé and Rabatel concluded the flight on January 21, when they arrived back in Villacoublay, but Capt. Girier was held up at Dijon, while the fourth pilot, Capt. Dagnaux, is at Aleppo on a special mission. The machines used were a Potez XV (450 Lorraine-Dietrich) and three Breguet XIX biplanes fitted respectively with 400 Renault, 500 Farman and 500 Hispano-Suiza engines.

### The R.A.F. Pocket Diary

WE have just received a copy of the R.A.F. Pocket Diary, published by permission of the Air Ministry by Gale and Polden, Ltd., of Wellington Works, Aldershot. At the outset we must say that this little diary is excellent in every way—it is, in fact, one of the best of its kind, that is, a diary produced for the use of those interested in some special subject, that we have seen for some time. In addition to the usual desiderata common to diaries it contains a host of information relating to aviation. Perhaps we cannot do better than just give a list of the items given in its pages, viz.: Notes on the R.A.F. Memorial Fund (10 per cent. of the published price of every copy sold being handed over to this Fund), and the Salting Benefaction Grants; The Royal Air

Force Tradition; Theatres of War in which the R.A.F. has operated from 1884 to date; Awarded the Victoria Cross (R.A.F.); Principal Events in the History of Service Aeronautes; Squadrons and dates of formation; Auxiliary A.F. Squadrons; Aircraft Carriers; Notable British Flights since the Great War; R.A.F. Display; British Air Mail and Passenger Services; Light Aeroplane Clubs; Aerial Derby, Gordon Bennett Balloon Race, Schneider Cup, and King's Cup Winners; Mortimer Singer Competition; Britannia Challenge Trophy; R.A.F. (Cadet) College; Aerial Societies and Clubs; Services Clubs and Institutes; Useful Formulae Efficiencies; English-Metric tables; Constitution of R.A.F. Sports Board and Addresses of Hon. Secs. of R.A.F. Sports Associations; List of Home Commands, Depots, Stations, etc.; Stations Abroad; and several pages devoted to R.A.F. and Service Sports. Thus, it will be seen, that it is well worth the 2s. (R.A.F. blue cloth) or 3s. (royal blue leather) at which it is published.

### London Air Defence; Vacancies for Subalterns

THE War Office announces that the anti-aircraft defences of London, which have been entrusted to the Territorial Army, are being steadily developed in both numbers and efficiency. There are, however, still a few vacancies for subalterns in the 26th Air Defence Brigade, and the officer commanding the brigade, Duke of York's Headquarters, Chelsea, will be glad to hear from prospective candidates and to communicate to them such information as they may desire. The 26th Brigade comprises Royal Artillery and Royal Engineer units, whose duty, in the event of an attack, would be to engage enemy aircraft with gun-fire, aided by search-lights, and to deal with any that might break through the outer defences. Training makes only a small demand on an officer's spare time.

# SECURITY IN THE AIR

## The Air League Warns the Country Against Dangers of Economy

At a luncheon given by the Air League of the British Empire at the Savoy Hotel, on January 22, a distinguished gathering discussed the serious effect which the economies, said to be contemplated for this year's Air Estimates, was likely to have on the question of national security against air attack, and it was pointed out that it was essential that the nation, the man in the street, should be made to realise the position and not be living under a false impression of security.

In the unavoidable absence of the President of the League, His Grace the Duke of Sutherland, the chair was taken by Mr. Philip S. Foster, Chairman of the Executive Committee of the League. After the loyal toast, Mr. Foster sketched a brief outline of the post-war history of aviation in Great Britain, pointing out the reduction which had taken place in the number of firms of which the British aircraft industry is composed, and which, at the end of the war, counted something like 150 firms, employing many hundreds of designers and thousands of skilled craftsmen, but which had now dwindled to a numerically small industry, although he was glad to say an industry sufficiently prosperous, and very efficient. He pointed out, however, that it would need but very little, such as a sudden shortening of orders, to place this industry in the condition of one struggling against adversity.

Information had recently reached the Committee of the Air League of the British Empire that there was a suggestion on foot that the completion of the Air Defence scheme for 52 squadrons might be reconsidered, and might even be reduced, on account of the need for economy. The rumour sounded like fantastic romance, but had come to them on good authority, and they, therefore, felt that immediate and drastic action must be taken. Such a policy was against the considered opinion of every single Government since the war. Mr. Foster then quoted examples from a number of speeches by responsible ministers in which it was laid down time after time, and had come to be accepted as an irreducible minimum, that British air power must include a home defence of sufficient strength adequately to protect us against air attack by the strongest air force within striking distance of this country.

They had been given to understand that as the result of the deliberations of the Colwyn Committee very considerable cuts would be made in the Air Estimates. It was further understood that such cuts might fall on the Vote for Technical and War-like Stores. This in turn would be reflected on the aircraft industry, which was still in such a position that the country could not possibly afford any further weakening of that industry. The air should be, and he felt in the future it must be our first line of defence, and yet we spent far less money on it than on the two senior services. Any further cutting down in the Air Force would render it still more inadequate, and we might almost as well be without it altogether. Mr. Foster then quoted a passage from the Geddes Committee Report on Economies of 1922.

Continuing, Mr. Foster said that, as the Air Force depended on the aircraft trade for its equipment, they had invited the Society of British Aircraft Constructors to state their views on the matter, and they had selected Mr. Fairey as their spokesman. He now had much pleasure in calling upon Mr. Fairey to address the assembly.

Mr. C. R. Fairey, Chairman of the Fairey Aviation Co., Ltd., and past Chairman of the Society of British Aircraft Constructors, said that a man in his position, in making a speech on the question of air defence at once laid himself open to attack on the score that he was an interested party, but that was a risk which was inevitable and which had to be accepted.

In a very closely reasoned, concise and dignified speech, Mr. Fairey outlined the position, and uttered a word of warning as to the consequences of interfering with an industry which had attained its present balance mainly on the promise that the policy hitherto followed would be pursued for several years to come. Mr. Fairey pointed out that the British aircraft industry was a very essential part of the whole Air Force scheme, and called attention to a fact which is sometimes apt to be overlooked, that aircraft were consumable munitions of war and that losses of 50 per cent. per month from the outbreak of hostilities of machines in the fighting line would not be an unfair estimate. This meant that in two months the Air Force would be immobilised on the ground unless the aircraft industry could provide the required number of new machines within that time.

Concerning reserves, it was understood that our present reserve was only about 100 per cent. In France there were approximately 4,000 machines in reserve, as against 1,500 machines in the first line, and he thought the reserves should be at least 300 per cent. of first-line machines, since, with the wastages to be expected on the outbreak of hostilities, anything less than about 300 per cent. of machines in reserve would mean the Air Force running short of flying stock before the aircraft industry could expand to the extent necessary to supply the needs of the Air Force. The time taken to do this Mr. Fairey put at about five months.

These estimates were based upon the aircraft industry as it existed today. If the information which had reached the Air League was correct, it was, he understood, proposed to reduce the amount of money available for the industry. The industry had dwindled down to something like twenty firms all told, out of which but four were aero-engine firms. Any interference with the programme hitherto followed, and any reduction of orders, would inevitably mean that some at least of these twenty firms would be compelled to close down. A result of this would be that an industry which under present conditions might be said to consist of firms which had survived and had now settled down to very keen technical, and to some extent financial, competition, under which it was just able to exist, would not be in a position to supply the R.A.F. in case of emergency with the machines required. It would appear that any cut would not only mean the loss of design staffs and skilled workmen, but it seemed to be useless to proceed with expansion of the Air Force without reserves of machines to give the industry time to get going. What was required was that the aircraft industry should be taken out of the realm of shifting policy, and in this connection Mr. Fairey pointed out that at the present moment the aircraft industry had little to offer to intelligent young engineers to take up an aeronautical career. In the last war there was a struggle of design as well as output, and where, he asked, were the designers of the future to come from unless there was a staple industry to offer them a career? What would make matters worse was the fact that, whereas in the last war it was possible with the comparatively primitive timber-built machines then in use, to make them in furniture factories, the modern aeroplane was such a highly specialised piece of apparatus that it could only be constructed in properly equipped factories.

Returning to the subject of the outbreak of war, Mr. Fairey called attention to the fact that no matter how strong the industry or how large the reserves, the standing Air Force must be capable of withstanding the first onslaught, which would be directed against Government buildings, munitions factories, railway and road centres, and so forth, and unless the standing Air Force was strong enough to withstand the first attack of an enemy there was little need to worry about the future, since in that case there would be no time or possibility for getting the aircraft works going on the larger scale required by war conditions.

Whichever way one looked at the subject, whether in the Locarno spirit or in any other spirit, it had always been axiomatic that Great Britain must rely upon her own strong right arm, and not upon the goodwill of her neighbours for protection. If this country had once established itself as the first Air Power in the world, it would be able to speak with authority and to be listened to on the subject of aerial disarmament. British air power had never been intended for other than defensive purposes, and there had never been any suggestion that it would ever constitute a danger to other nations by being used for offensive purposes. If economies were necessary he thought the other services should come first. They were told that they would starve in three months if the Navy could not hold open the sea routes, but if they lost the first advantage in an aerial attack, the war would not last three months. Having once attained a position as the first Air Power they would be able to get that aerial disarmament which would enable them to turn their resources to the development of air power for the purpose of peace.

Commander Kenworthy, M.P., in passing a vote of thanks to the Chairman and to Mr. Fairey, said that if economies were essential there were savings to be made with less risk in other services. The time had come when there should be one spending department for the three services acting under a Ministry of Defence, as that was the only way in which they could ensure proper allocation of the funds available for defence.

# THE ROYAL AIR FORCE

London Gazette, January 19, 1926

## General Duties Branch

The following are granted perm. commns. in the ranks stated (Jan. 1)—  
*Flight Lieuts.*—H. C. Irwin, A.F.C., A. D. Rogers, A.F.C., W. E. Swann, G. O. Venn. *Flying Officers.*—E. F. Haylock, G. H. Vasse.

A. P. K. Hattersley is granted a short service commn. as a Flying Offr. on probation, with effect from and with seny. of Jan. 11. Flying Offr. S. T. Kemp is placed on retired list; Jan. 17. Flying Offr. E. J. Rossiter is placed on retired list on account of ill-health; Jan. 20.

The following are transferred to the Reserve:—

*Class A.—Flight Lieuts.*—N. H. Jay; Jan. 18. W. N. Cumming, D.F.C.; Jan. 21. *Flying Offrs.*—G. S. Brown, D. H. Geeson, J. de la P. B. Preston; Jan. 15. M. K. McGregor, R. V. D. White; Jan. 18.

*Class C.—Flying Offr.* S. T. Tipper; Jan. 17.

The short service commn. of Pilot Offr. on probation A. C. Foreman is terminated on cessation of duty; Jan. 20. Flying Offr. H. P. F. Fagan (Lieut., Som. L.I.) relinquishes his temp. commn. on return to the Army; Jan. 12.

## Medical Branch

J. Magner, M.B., is granted a short service commn. as a Flying Offr. for three years on the active list, with effect from and with seny. of Jan. 6, 1926.

## Reserve of Air Force Officers

E. P. Lash is granted a commn. in Class A.A., General Duties Branch, as a Pilot Offr. on probation; Jan. 4. Flying Offr. W. E. Taylor resigns his commn.; Nov. 12, 1925.

London Gazette, January 22, 1926.

## General Duties Branch

Air Commodore L. F. Blandy, C.B., D.S.O. (Colonel, Army), is seconded for a further period of service with the R.A.F.; Nov. 30, 1925. Wing Commander G. P. Grenfell, D.S.O., is appointed Deputy Director of Research (Instruments), Air Ministry, vice Wing Commander James Bevan Bowen, O.B.E.; Jan. 11. Flying Officer R. A. P. Roberts is restored to full-pay from half-pay; Jan. 6.

ERRATUM.—Gazette of Dec. 15, 1925 (FLIGHT, Dec. 24, 1925, p. 845):—For R. E. Costa read R. Costa.

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified:—

### General Duties Branch

*Group Captain:* A. G. Board, C.M.G., D.S.O., to R.A.F. Depot, on transfer to Home Estab.; 1.1.26.

*Wing Commanders:* O. T. Boyd, O.B.E., M.C., A.F.C., to R.A.F. Depot, while attending course at Army Staff Coll., Camberley; 21.1.26. A. ap Ellis, C.B.E., to H.Q. Air Defences of Great Britain, for Personnel Staff duties, on transfer to Home Estab.; 1.1.26.

*Squadron Leaders:* A. R. C. Cooper, to R.A.F. Depot, on transfer to Home Estab.; 9.1.26. A. D. Pryor, to No. 5 Flying Training Sch., Sealand; 14.1.26. G. F. Broose, D.S.C., to R.A.F. Depot, on transfer to Home Estab.; 8.1.26. R. T. Leather, A.F.C., to R.A.F. Depot, on transfer to Home Estab.; 24.12.25. G. S. Trewin, A.F.C., to R.A.F. Depot, on transfer to Home Estab.; 12.12.25. K. C. Buss, to R.A.F. Depot on transfer to Home Estab.; 27.11.25.

*Flight Lieuts.:* A. R. Mackenzie, to Station H.Q., Andover, on transfer to Home Estab.; 21.1.26. R. C. Bryant, to Heliopolis Details, Egypt; 21.12.25. W. E. G. Bryant, M.B.E., to No. 2 Sqdn., Manston; 4.11.25. W. E. Somervell, A.F.C., to No. 2 Sqdn., Manston; 14.12.25. A. G. Jones-Williams, M.C., F. L. Luxmoore, D.F.C., and R. V. Bramwell-Davis, to R.A.F. Depot, on transfer to Home Estab.; 12.12.25. F. Fernihough, M.C., M. Keegan, O.B.E., M.M., P. E. Gwyer, M.B.E., A. S. Thompson, H.V. Rowley, S. L. Quino, M.C., G. Y. Tyrrell, M.C., R. D. Starley, M.C., and G. Archer, to R.A.F. Depot, on transfer to Home Estab.; 31.12.25. R. J. M. De St. Leger and T. Humble, to R.A.F. Depot, on transfer to Home Estab.; 21.12.25.

*Flying Officers:* G. S. Taylor, to Heliopolis Details, Egypt; 12.12.25. W. F. Warner, to R.A.F. Depot, on transfer to Home Estab.; 20.12.25. W. F. Warner, to No. 9 Sqdn., Manston; 1.2.26. J. N. Jaques, to R.A.F. Depot, on transfer to Home Estab.; 9.1.26. H. W. R. Banting, to No. 58 Sqdn., Worthy Down, on transfer to Home Estab.; 23.1.26. J. S. Wilkins, to R.A.F. Depot; 22.1.26. A. Page, to Record Office, Ruislip; 15.1.26. G. V. Wheatley, to No. 22 Sqdn., Martlesham Heath; 15.2.26. C. W. S. Chalmers, to R.A.F. Depot; 21.1.26. C. C. Musselwhite, to remain at No. 5 Sqdn., India, instead of to R.A.F. Depot, as previously notified. G. W. Higgs, to No. 19 Sqdn., Duxford; 28.1.26. (Hon. Flight-Lieut.) P. I. V. Rippon, to R.A.F. Base, Calshot; 19.1.26. A. W. Crees, to remain at No. 4. Armoured Car Co., Iraq, instead of to R.A.F. Depot, as previously notified. J. H. Hargroves, F. S. Waincoat, J. Bradbury, C. B. McIntyre, E. C. N. Jeffries, R. A. R. Mangles, M. C. W. C. Flint, M.C., and B. R. C. Coope, to R.A.F. Depot, on transfer to Home Estab.; 21.12.25. A. M. Reidy, L. E. Dowse, I. M. Morris, H. R. McL. Reid, D.F.C., and T. B. Bruce, M.C., to R.A.F. Depot, on transfer to Home Estab.; 31.12.25. F. H. H. Twelvtree, to R.A.F. Depot, on transfer to Home Estab.; 4.1.26. R. F. De R. Read, to R.A.F. Depot, on transfer to Home Estab.; 21.12.25. H. J. Soper, to Marine Aircraft Experimental Estab., Felixstowe, on transfer to Home Estab.; 12.12.25. C. C. Clark, to Mechan. Transport Repair Depot, Shrewsbury, on transfer to Home Estab.; 12.12.25. G. H. Vasse and S. A. Lane, to R.A.F. Depot, on transfer to Home Estab.; 12.12.25. H. A. Bayne, to No. 25 Sqdn., Hawkinge, on transfer to Home Estab.; 12.12.25. J. B. Barrett, to R.A.F. Depot, on transfer to Home Estab.; 12.12.25.

*Pilot Officers:* J. G. D. Armour, to No. 111 Sqdn., Duxford; 31.1.26. The undermentioned Pilot Officers are all posted to No. 4 Flying Training School, Egypt, with effect 15.1.26:—N. J. Anderson, G. M. Beattie, J. E. A.

Binnie T. J. L. Bradley, L. S. T. Brown, N. R. Buckle, W. B. Causer, G. R. T. Clarke, M. A. Cowan, P. H. Danger, A. P. de Wouff De Wytt, C. E. Eckersley-Maslin, C. L. Edwards, G. H. Godwin, W. E. W. Grieve, H. R. Hawker, J. E. McC. Henderson, D. J. R. Hylton, H. E. Milton, P. A. Moritz, A. W. H. Nelson, E. G. Oslen, J. H. Pool, A. A. Radclyffe, H. T. A. Silcox, L. M. Timmins, L. S. Tindall, C. Warsaw, C. D. G. Welch and F. H. Bailey.

### Stores Branch

*Squadron Leader:* T. G. Skeats, to R.A.F. Depot, on transfer to Home Estab.; 31.12.25.

*Flight Lieuts.:* K. D. G. Collier and L. H. Vernon, to R.A.F. Depot, on transfer to Home Estab.; 31.12.25. E. W. Crosbie, to R.A.F. Depot, on transfer to Home Estab.; 12.12.25.

*Flying Officers:* W. A. Kyte, to No. 3 Sqdn., Upavon; 13.1.26. W. B. Frederick to Central Flying Sch.—Upavon; 13.1.26. E. V. E. Andrewartha, to R.A.F. Depot, on transfer to Home Estab.; 21.12.25. C. A. Longhurst, to R.A.F. Depot, on transfer to Home Estab.; 31.12.25.

*Pilot Officer:* C. P. Marshall, to No. 41 Sqdn.—Northolt; 13.1.26.

### Accountant Branch

*Flight Lieut.:* J. C. Brice, to No. 2 Flying Training Sch., Digby; 25.1.26. *Flying Officers:* J. Freeman-Fowler, W. A. Wadley, and C. G. Prior to R. A. F. Depot, on transfer to Home Estab.; 12.12.25.

### Medical Branch

*Sqdn. Leaders:* A. J. O. Wigmore, M.B., to R.A.F. British Hospital, Iraq; 13.12.25. P. T. Rutherford, O.B.E., to Station Commandant, Hinaidi; 13.12.25. G. S. Marshall, O.B.E., D.P.H., D.T.M. & H., to Air Ministry; 15.1.26. J. M. A. Costello, M.C., M.D., M.Sc., to R.A.F. Depot, on transfer to Home Estab.; 12.12.25.

*Flight Lieuts.:* J. R. Crolus, M.B., to R.A.F. Depot, on transfer to Home Estab.; 20.12.25. J. C. Osburne, M.B., to Specialists' Medical Estab. 13.1.26. J. A. Musgrave, D.P.H., to R.A.F. Depot, on transfer to Home Estab.; 31.12.25. G. R. Nodwell, M.B., and F. K. Wilson, M.B., to R.A.F. Depot, on transfer to Home Estab.; 12.12.25. C. T. Hastings (Dental), to R.A.F. Depot, on transfer to Home Estab.; 31.12.25.

*Flying Officers:* G. J. Hanly, M.B., to No. 27 Sqdn., India; 18.12.25. B. W. Cross, to No. 28 Sqdn., India; 18.12.25. J. McC. Kilpatrick, M.B., to No. 60 Sqdn., India; 18.12.25. C. G. J. Nicolls, M.B., to Aircraft Park, India; 18.12.25. R. F. G. Dickson, to Aircraft Depot, India; 18.12.25. C. J. S. O'Malley, to Research Lab. and Med. Officers' Sch. of Instruction, Hampstead, for short course; 14.1.26. R. L. C. Fisher, M.B. and S. S. Proctor, M.B., to R.A.F. Depot, on transfer to Home Estab.; 12.12.25.

*Flying Officers (Q.Mastr. Medical):* W. Gamblen and W. King, to R.A.F. Depot, on transfer to Home Estab.; 12.12.25. W. King, to R.A.F. Hospital, Cranwell; 22.1.26.

## NAVAL APPOINTMENTS

The following appointments were made by the Admiralty on January 19:—

### Royal Marines

*Lieuts., R.M. (Flying Officers, R.A.F.):* T. L. G. Bryan, to Egmont, and for 440 Flight, supy., pending posting to 441 Flight; and O. C. Jones, to Egmont and for 402 Flight, supy., pending posting to 403 Flight; Jan. 9.



### Married

GEORGE W. F. DARVILL, D.F.C., son of Mr. G. Darvill, formerly of East Meon, was married on January 16, at Ashtead, to VIOLET RUTH, youngest daughter of Mr. and Mrs. CHARLES D. COLLINS, of Ashtead.

Flight-Lieut. CHRISTOPHER THOMAS O'NEILL, O.B.E., R.A.F. Medical Service, the son of John O'Neill, J.P., Sarsfield Court, Riverstown, Glanmire, Co. Cork, was married on January 16, at St. Andrew's Chapel, Belford Road, Edinburgh, to JANE DOROTHY, daughter of the late WILLIAM LAING, Nairn, and of Mrs. LAING, 30, Murrayfield Avenue, Edinburgh.

### To be Married

The engagement is announced, and the marriage will take place on February 16, at 2.15, at All Souls, Langham-place, between Flying-Officer RALPH WOODCOCK GIFFORD LYWOOD, son of Colonel Lywood, of Alverstoke, and MARGARET, younger daughter of Mr. and Mrs. F. J. SMITH, of Alverstoke.

The engagement is announced of Flight-Lieut. H. S. SCROGGS, R.A.F., only son of Commander H. C. Scroggs, R.N. (retired), and Mrs. Scroggs, Colden Common, Winchester, and MARGARET FRAY (PEGGY), only daughter of Mr. and Mrs. E. E. POWELL, Shawford, Winchester.

## ROYAL AERONAUTICAL SOCIETY



**Lecture.**—On February 4, at 7 p.m., an important Joint Meeting with the Institution of Automobile Engineers will be held at the Royal Society of Arts, 18, John Street, Adelphi, W.C. 2. At this meeting, the third lecture of the second half of the Sixty-First Session, Mr. Charles L. Lawrance, Vice-President and General Manager of the Wright Aeronautical Corporation, will read a paper on "American Aircraft Engine Development." Mr. Lawrance is paying a special visit to this country in connection with the paper, and his lecture, in view of the recent advance in American engine design, will prove highly informative. Light refreshments will be served at 6.30 p.m.

**New Branches.**—A number of new branches of the Society are already in process of formation, following on the result of the Special General Meeting of the Society held on December 30, 1925. The membership of the first of these new branches to be formed, at Coventry, already exceeds 100.

**New Grade.**—The forms of application to the new technical grade of the Society, Associateship, are now ready. This grade is open to anyone employed in a technical capacity in the manufacture or operation of aircraft who have in the opinion of the Council sufficient qualifications to warrant their election. Full particulars of the rules governing the new grade, and the privileges, may be obtained from the Honorary Secretary.

J. LAURENCE PRITCHARD,  
Honorary Secretary.

## CORRESPONDENCE

### PROPOSED AMATEUR AIRSHIP CLUB

[2115] In view of the Government's drastic action by economising at the expense of practical airship research, may I suggest that the scheme recently put forward by Commander Boothby should receive more than passing comment in your valuable columns.

It is essential that our airship personnel should not be allowed to become "stagnant."

The formation of an Amateur Airship Club on practical lines would, to a small extent, provide a means of overcoming this stagnation, and, further, what in the writer's mind is of more importance, it would encourage the modern youth to take an active interest in the development and control of "lighter-than-air" machines.

In conclusion, the writer is of the opinion that Commander Boothby would receive enthusiastic support from all interested in the oldest branch of aviation.

H. ALEC S. GOTHARD, F.R.S.A.

Bickley, Kent.  
January 23, 1926.

### R.A.F. Officers and Flying Risks

In a memorandum recently issued by the Air Ministry it states that the question of insuring against flying risks is known to have exercised the minds of officers for some considerable time past and that there is reason to believe that particulars of methods by which various life offices are prepared to cover risks are not known. As a result, the Air Ministry has been in negotiation with the British Life Offices Association and has formulated two schemes, Scheme A and Scheme B. Under Scheme A, R.A.F. officers can cover the risks of flying by payment of a fixed annual extra; this extra varies according to the rank of the officer from five guineas per cent, for pilot officers to 15s. per cent, for an Air Commodore (no charge being made for officers above that rank), and is payable for a maximum period of five years. Under Scheme B the extra premium depends primarily upon the amount of flying done, the general charge being 9d. per flight per £100 assured, the amount of extra premium payable in any one year being determined by the production of a certified extract from the officer's log book.

### "Titanine" Lacquers

DURING the last few years Titanine-Emailite, Ltd.—the makers of the famous aeroplane dopes bearing these names—have conducted exhaustive research work in the production of high-class lacquers, suitable not only for the motor-car trade but for aircraft metal parts. We understand that this work has given highly successful results and that the firm is now in a position to supply lacquers of all types, for which they claim the same pre-eminence that "Titanine" has achieved. They will be pleased to give any of our readers who may be interested full particulars regarding these lacquers.

## PUBLICATIONS RECEIVED

**Technical Notes:** No. 228.—The Flettner Rotor Ship in the Light of the Kutta-Joukowski Theory and of Experimental Results. By F. Rizzo. October, 1925. No. 229.—An Altitude Chamber for the Study and Calibration of Aeronautical Instruments. By H. J. E. Reid and O. E. Kirchner. November, 1925. U.S. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

**International Meteorological Organisation:** Report of the Meeting in London, April 16-22, 1925, of the Commission for the Exploration of the Upper Air. Air Ministry, Meteorological Office. M.O.281. H.M. Stationery Office, Kingsway, London, W.C. 2. Price 2s. net.

**Aeronautical Research Committee, Reports and Memoranda.**—No. 980 (Ae. 193).—The Rolling and Yawing Moments of an Aerofoil in Straight Flight. By H. Glauert, M.A. July, 1925. H.M. Stationery Office, Kingsway, London, W.C. 2. Price 3d. net.

**No. 4 Apprentices Wing Magazine.** Vol. IV, No. III. Christmas, 1925. The Boys' Wing Magazine, R.A.F., Cranwell, Lines.

**The Official Gazette of the United States Patent Office.** December 15, 1925. Vol. 341, No. 3. United States Patent Office, Washington, D.C., U.S.A.

**The Canadian Patent Office Record.** Vol. LIII. Nos. 49 and 50. December 8 and 15, 1925. Canadian Patent Office, Ottawa, Canada. Price 25 cents each.

**La Guerra y su Preparacion.** November, 1925. Vol. X, No. 5. Estado Mayor Central del Ejercito, Madrid.

**Automobile Worm Gearing.** David Brown and Sons (Huddersfield) Ltd., Park Works, Lockwood, Huddersfield.

**Notiziario Tecnico.** No. 6. December, 1925. Ufficio di Stato Maggiore della R. Aeronautica, Direzione della Rivista Aeronautica, Via Torino, 39, Rome.

**Official Gazette of the United States Patent Office.** December 22, 1925. Vol. 341, No. 4. United States Patent Office, Washington, D.C., U.S.A.

**L'Annuaire du Bureau des Longitudes pour 1926.** Gauthier-Villars et Cie., 55, Quai des Grands-Augustins, Paris. Price 8 fr. net.

**Winged Defense.**—By Wm. Mitchell. New York and London: G. P. Putnam's Sons. Price 10s. 6d. net.

**The Official Gazette of the United States Patent Office.** December 29, 1925.—The United States Patent Office, Washington, D.C., U.S.A.

## AERONAUTICAL PATENT SPECIFICATIONS

**Abbreviations:** Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

### APPLIED FOR IN 1924

Published January 28, 1926

25,443. BRISTOL AEROPLANE CO., LTD., W. L. GARRETT and J. HALL. Engines for vehicles. (245,229.)

### APPLIED FOR IN 1925

Published January 28, 1926

1,149. G. W. BRYANT and F. P. BEVIS. Rotary i.c. engines, etc. (245,277.)  
5,085. ENGLISH ELECTRIC CO., LTD., W. E. M. AYRES and E. H. H. HASSLER. Method of and apparatus for balancing of bodies. (245,305.)  
5,215. W. DE WASMUNT. Valve-packing devices for revolving cylinder engines. (230,071.)  
14,702. CIE D'APPLICATIONS MECANQUES. Fastenings for shock absorber (235,219.)  
17,643. H. JUNKERS. Screw propellers. (237,245.)

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